

EDITORIAL

Financing and Used Cars

TO a man who is considered an authority on automobile financing came a group of dealers the other day and said something like this:

"We have been able to get very liberal terms for our customers in financing new car sales. It hasn't been difficult recently for us to get finance companies to handle 20 per cent down and 18 months-to-pay business. That has helped us to sell new cars.

"But in a good many cases these liberal terms on new cars have made used cars a very unattractive buy. Most finance companies won't extend nearly such liberal terms on used cars. In some cases it actually figures out cheaper for a man to buy a new car than to buy a used one because of the difference in terms that we can get for him.

"We must sell used cars or we can't keep going. How can we get more liberal terms on used cars financing so as to make it possible to sell used cars in competition with the new cars on which very liberal terms already are available?"

We don't know what this authority answered. But we offer the suggestion that perhaps what is needed is not more liberal terms on used cars, but less liberal terms on new cars. Factory opinion on this question will be of importance in determining the used car situation in the next twelve months. The used car market is not in as good condition today as it was six months ago.

Go to the Shows!

SPECIAL days set aside for trade attendance were tried out at the national shows last year for the first time.

The experiment was a success. Most of those executives and engineers, both of vehicle and parts companies, who spent a lot of time in the shows came away feeling well repaid for their efforts.

A good many factory men didn't fully appreciate the idea and didn't bother much about it one way or the other. They failed to see the value of meeting men from other parts of the industry, of talking with dealers, of examining products of parts makers, of explaining their own product to men in the trade and of generally widening their vision.

Some business can be transacted in hotel rooms that can't be transacted in a booth at the show. Everybody recognizes that fact.

But what a good many people don't seem to realize is that—

A lot of people can be met and a lot of things can be learned at the show that never in the world will cross the horizon of the man who spends show week in a hotel room.

Monday and Tuesday mornings, January 11 and 12 have been set aside as Trade Days at the 1926 Show. Chief executives of factories can assure maximum value for the money spent in taking their staffs to New York or Chicago show week in no better way than by urging upon members of those staffs attendance at the show on the Trade Days.

The Diesel Automotive Engine

DIESEL engines are being built in constantly smaller sizes, and serious efforts are being made at present to adapt them to automotive purposes. The chief difficulties to be overcome relate to specific weight, or weight per horse power, which must be brought down to a figure comparable with that of present truck engines.

One branch of the automotive field in which the outstanding advantage of the Diesel engine, viz., low fuel cost, is of particular importance, is that of the rail car, and it is in this that we may expect the Diesel to prove a serious competitor to the Otto type engine within the next few years.

Owing to the greater difficulty of holding compression in a smaller cylinder, the tendency naturally is to limit the number of cylinders. This, of course, means that individual impulses will be quite heavy and that, to withstand these, a heavy frame must be employed. By the use of steel and aluminum for the structural members, in place of cast iron, manufacturers have brought down the weight per horse power unit of 200 hp. and over, to between 12 and 16 lb.

Reduction in the weight of the engine requires, first of all, an increase in its operating speed, and the impression prevails that this involves very great difficulties in the Diesel engine, in which the combustible charge must be formed during the first 10 per cent or so of the power stroke. It is therefore interesting to note what has been accomplished in this direction. The two-cylinder Benz tractor engine described in a recent issue of *Automotive Industries*, operates at a piston speed of about 1050 ft. p. m., while a series of larger engines being built by Wm. Beardmore & Co., Ltd., of Glasgow, of which some are being fitted to railcars for the Canadian National Railways, have a piston speed as high as 1500 ft. p. m.

It is evident, therefore, that a weight efficiency acceptable from the automotive standpoint, is possible with Diesel engines. True, rather expensive methods are being resorted to to obtain this weight efficiency, such as an aluminum cylinder and crankcase block in the Benz and a steel block with aluminum head with steel valve seat inserts in the Beardmore, but the great difference in the price of crude oil and gasoline, together with the higher thermal efficiency of the Diesel engine warrant such construction.

AUTOMOTIVE **NEWS SECTION** INDUSTRIES

Philadelphia, Thursday, November 19, 1925

Car Sales Lower, Output Declines; Tax Prospects Affect 1926 Plans

PHILADELPHIA, Nov. 19—New car sales have shown a marked drop during the last two weeks. Production has not shown a corresponding decline, but as a general condition retrenchment is the rule at the factories. The showing-up of output after such a period of record-breaking activity as marked the entire month of October would naturally be expected to take some little time. The current surplus of production over sales to consumers cannot be considered a danger sign, as most of the dealers in the leading lines went into November with virtually no stocks on hand.

The prospects of Federal tax reductions on automotive products are having an effect on the production plans of the manufacturers. If the House Ways and Means Committee had decided to eliminate the levies entirely, the producers would be preparing for a somewhat higher level of business next year than is now the case. But even so, the saving to automotive buyers of about \$70,000,000 a year, as provided in the bill in its present form, should prove a good deal of a stimulant to sales.

Prosperity Ahead in 1926

Lower taxes are not the only sign of good automobile business ahead. The generally high level of business activity in the country and the constantly expanding volume of foreign sales combine to promise a continuation of prosperity in the automobile industry at least during the first half of 1926. But the automobile producers have seen slumps develop suddenly and unaccountably before, and they will not be unprepared if the unexpected happens.

It is regarded as fairly certain that December will be a month of rather low activity, especially in sales of new cars. This condition has now become a familiar yearly phenomenon, but efforts are being made to bring automobile selling during the holiday season more in step with the brisk business done in other retail lines. There is no reason why cars should not be Christmas gifts any more than a number of other high-priced articles that are given until it hurts.

Willys-Overland is Balancing Output

TOLEDO, Nov. 19—Willys-Overland production is being balanced up, with consequent layoffs effective in some departments this week. Schedules are now being planned so that the inventory a few weeks hence will see almost a clean-up of regular stocks at the factory.

Rates Question Vital, Finance Meet Hears

Parley Hits Extension of Terms Beyond One-Third Down, Balance in Year

CHICAGO, Nov. 18—Members of the National Association of Finance Companies, at the convention held in the Hotel Sherman here Monday and Tuesday, reaffirmed the resolutions of a year ago, expressing the conviction that automobile retail time sales should be on the basis of one-third down and the balance in twelve equal monthly installments. This action was taken after efforts to modify the resolutions to cover some of the practices now widely in effect had failed, and with the full realization that the standard under existing conditions represented no more than a hope and an ideal. Anything approaching general adherence to the resolutions was regarded as out of the question.

Question of Rates Predominates

The delegates to the convention were much more eager to discuss rates than terms. It was brought out that the new arrangements made by several automobile manufacturers with finance companies carried rates that the majority of the companies felt they were unable to meet. Declaring that this situation was one that would, in the long run, have a bad effect on automobile sales, the delegates passed a resolution calling for the appointment of a committee to call upon manufacturers and set before them the factors entering into financing rates and the results that might be expected to follow from the establishment of unprofitably low rates.

E. S. Hare, vice-president, Hare & Chase, Inc., evidently voiced the sentiments of a large number of finance company representatives when he said that the vital point today is the question of

NEW HUPP PLAN TO FINANCE SALES

NEW YORK, Nov. 19—The Hupp Motor Car Corp. of Detroit has completed arrangements with the Commercial Investment Trust Co. of this city for a plan to finance Hupp sales similar to the plan recently announced with reference to Dodge cars.

Details as to the rates which will apply under this plan are not yet available, but are described as low in comparison with prevailing rates.

One feature of the Dodge plan, which is understood to apply to the Hupp plan, is that purchasers are not required to finance their purchases through the Commercial Investment Trust Co. or to restrict themselves to the insurance arrangements provided by the plan.

rates. In most cases, he asserted, where factories are advertising low financing rates there may be a tendency to mislead the public if they are absorbing part of the cost in the list price of the car.

"We know the factors that go into financing rates," he asserted, "and we know what are fair rates."

Hard to Make Legitimate Profit

No reply was made to these charges, but inquiry developed that by no means all the companies not allied with factories believed that subsidies were granted. However, the statement was generally made that even the big financing companies could not make a legitimate profit and obtain the necessary capital for expansion on the rates under the factory plans.

Among the speakers who strongly urged adherence to the standard of one-third down and the balance in twelve payments were Henry Ittleson, president, Commercial Investment Trust, Inc., New York.

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Rolls-Royce May Enter Into Active Plane Making

NEW YORK, Nov. 18—Claude Johnson, managing director of the English Rolls-Royce Co., has come to the United States to discuss with his associates the possibility of their entering actively into the airplane production field and to make his periodical inspection of the American works of the company at Springfield, Mass.

He said that the new types of airplane engines to be produced by Rolls-Royce in England would be revolutionary in design and performance.

A.E.A. Votes Merger With M. & A.M.A.

Convention and Show Close a
Successful Week—All Are
Optimistic for 1926

CHICAGO, Nov. 17—The Tenth Annual Convention and Seventh Annual Show of the Automotive Equipment Association, which ended here Saturday, was the most successful the association has ever held.

The outstanding action of the convention was the voting of authority to the board of directors to consummate the proposed merger with the Motor and Accessory Manufacturers Association, provided the latter approve the merger at its annual meeting in January. Thus, the possibility is presented of the two associations becoming one before the next annual convention and show are held. The action taken was unanimous.

Next Convention Nov. 8-15, 1926

It was decided to hold the convention and show in 1926 at the Coliseum here in the week of Nov. 8-15. By vote of the convention, attendance at the show next year will be more restricted than for the last two years. It will be open only to members and invited guests, but invitations will also be extended to jobbers, provided they file application not later than thirty days before the show opens.

New officers of the association, whose names are given in this column, were installed at the Saturday morning session.

The total number of exhibitors at the show was 225, of which 212 were manufacturers of automotive equipment, and the remainder publications and special departments of the A.E.A. headquarters.

Every manufacturer and distributor present was optimistic for 1926. They are of the opinion that the coming year will set an even higher mark than 1925.

New Officers and Directors

New officers of the Automotive Equipment Association, are: president, N. F. Ozburn, of Ozburn-Abston Co., Memphis, Tenn., who succeeds W. T. Morris, of the American Chain Co., Bridgeport, Conn.; and vice-president, Earl V. Hennecke, of the Moto-Meter Co., Long Island City, N. Y.

New directors were elected as follows:

District 1: 3-year term: G. W. Fleming, Fleming Machine Co., Worcester, Mass.; 2-year term, C. S. Owen, Chapin-Owen Co., Rochester, N. Y.; 1-year term, R. P. Green, Wetmore-Savage Auto Equipment Co., Boston, Mass.

District 2: 3-year term, R. W. Shreiner, General Auto Supply Co., Harrisburg, Pa.

District 3: 3-year term, D. S. Brisbin, Columbus McKinnon Chain Co., Columbus, O.; 2-year term, B. N. McGregor, Packard Electric Co., Warren, O.

District 4: No election.

District 5: 3-year term, F. H. Suter, Shadbolt & Boyd Iron Co., Milwaukee.

District 6: 3-year term, F. J. Tenk, Tenk Hardware Co., Quincy, Ill.; 1-year term, H. E. Patterson, Warner-Patterson Co., Chicago.

District 7: No election.

District 8: 2-year term, H. J. Banta, The Banta Co., Los Angeles.

District 9: 1-year term, W. P. Kearney, Dominion Chain Co., Niagara Falls, Ont.

Kelly-Springfield Opens Branch Dec. 1

SPOKANE, WASH., Nov. 18—A factory branch, representing an investment of \$250,000, will be opened Dec. 1 by the Kelly-Springfield Tire Co., George M. Martin, special representative of the company has announced here. The firm has leased a warehouse for a period of three years, with an option to extend the lease for two years more.

Mr. Martin also announced the appointment of J. R. Bennyhoff, formerly in charge of the San Francisco branch, as manager of the local branch. The territory to be served by the new branch includes a part of Washington, all of Idaho and a part of Montana.

Wright Corp. Plans New Small Engines

PATERSON, N. J., Nov. 14—With the growth of flying as a sport and anticipating a demand for small engines for light planes, the Wright Aeronautical Corp. has announced that it has added to its engineering staff Harold E. Morehouse, designer of the Morehouse 80-cu. in. 30-h.p. engine, and will go into production on these engines with deliveries starting soon after Jan. 1. This engine is of the two-cylinder opposed air-cooled type and is so designed that it probably can be manufactured at a cost of somewhere around \$500, thus fulfilling the need for an efficient, reliable aircraft engine of small piston displacement and low initial cost.

Spicer Mfg. Co. May Sell Abroad

NEW YORK, Nov. 17—The possibility that the Spicer Manufacturing Co. may eventually expand its business by manufacturing automobile supplies in England was intimated by R. E. Carpenter, vice-president in charge of operations, upon his recent return from Europe.

He said that European automobile business had definitely turned the corner, with manufacturers in better shape than ever, and he expects large expansion of the use of commercial as well as passenger motor vehicles in Europe. He estimates that, for the last half of 1925, Spicer's foreign business will run at least 50 per cent ahead of the same period of 1924.

Business in Brief

Written exclusively for AUTOMOTIVE INDUSTRIES by the Guaranty Trust Co., second largest bank in America.

NEW YORK, Nov. 18—The advance in the rediscount rate of the Federal Reserve Bank of Boston last week from 3½ to 4 per cent was followed by abrupt declines in stock prices, which occurred in a market of record-breaking activity. On Monday of this week it was announced that similar action had been taken by the Federal Reserve Bank of Cleveland.

UNFILLED STEEL ORDERS

Unfilled orders reported by the United States Steel Corp. on October 31 amounted to 4,109,183 tons, as compared with 3,717,297 tons at the end of September, and 3,525,270 at the end of October, 1924.

BUILDING CONTRACTS

Building contracts awarded last month in 36 states, according to the F. W. Dodge Corp., had a total value of \$519,528,200, which is 5 per cent smaller than the September figure, but 27 per cent larger than that for October last year. The total for the first ten months of 1925 is larger than that for the entire year 1924.

CAR LOADINGS

Car loadings in the week ended October 31 numbered 1,091,273, comparing with 1,121,459 in the preceding week and 1,073,430 in the corresponding period last year.

EXPORTS AND IMPORTS

Preliminary figures for October show exports amounting to \$492,000,000 and imports to \$375,000,000, as against exports of \$420,000,000 and imports of \$350,000,000 in September, and exports of \$527,000,000 and imports of \$311,000,000 in October, 1924.

FISHER'S INDEX

Fisher's index of wholesale commodity prices stood at 158.7 last week, as compared with 158.6 in the preceding week, and 156.5 four weeks earlier.

FEDERAL RESERVE STATEMENT

Bills and securities held by the Federal Reserve banks declined \$56,200,000 in the week ended November 10, with a decrease of \$71,700,000 in discounts partially offset by gains of \$10,200,000 in open market purchases and \$3,800,000 in Government securities. Note circulation declined \$2,100,000 and deposits \$26,300,000, while reserves increased \$10,200,000. The reserve ratio rose from 71.5 to 72.3 per cent.

MONEY

Call and time loan rates were unchanged last week, the former ranging from 4½ to 5 per cent and the latter from 4½ to 5 per cent. Commercial paper was slightly easier, with the maximum rate at 4½ per cent, as against 4½ per cent in the preceding week.

G. M. October Sales 95,703, New Record

Dealers to Users Figures Up
40,336—Divisions to Dealers
Nearly Double

DETROIT, Nov. 17—Sale of General Motors passenger cars and trucks by dealers to users in October totaled 86,339, as compared with 46,003 in 1924, an increase of 40,336.

The sales of passenger cars and trucks to dealers by the different manufacturing divisions during the past month totaled 95,703, almost double that for October, 1924. It created another new sales record. The following tabulation shows monthly sales of General Motors passenger cars by dealers to ultimate consumers and sales by the manufacturing divisions of General Motors to their dealers:

	Dealers Sales to Users		Division Sales to Dealers	
	1925	1924	1925	1924
Jan.	25,593	33,574	30,642	61,398
Feb.	39,579	50,007	49,146	78,668
Mar.	70,594	57,205	75,527	75,484
Apr.	97,242	89,583	85,583	58,600
May	87,488	84,715	77,223	45,965
June	75,864	65,224	71,088	32,984
July	65,872	60,836	57,358	40,563
Aug.	78,638	54,842	76,462	48,614
Sept.	83,519	48,565	89,018	51,955
Oct.	*86,339	46,003	*95,703	49,552

* These preliminary figures include passenger car and truck sales in the United States, Canada and overseas by the Chevrolet, Oldsmobile, Oakland, Buick and Cadillac manufacturing divisions of General Motors.

Packard \$20,000,000 Increase in Common

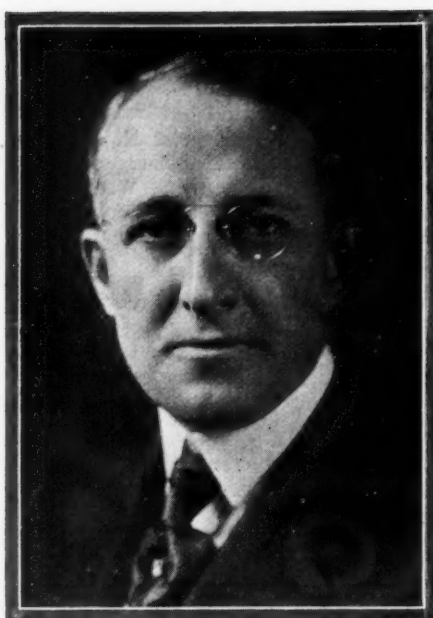
DETROIT, Nov. 16—The Packard Motor Car Co. has authorized the increase in common from \$30,000,000 to \$50,000,000. The board of directors and the officers of the company are unchanged.

President Alvan Macauley stated that, of the present authorization of \$30,000,000 of common stock, only \$23,770,200 had been issued, and that nothing had yet been done to issue the authorized increase in common. The authorization does not, of course, mean that the full amount will be issued. The increase takes the place of the \$20,000,000 of preferred stock which has been released, and brings the full authorized capitalization of the company up to \$50,000,000.

Goodyear Co. Plant Additions Ready Jan. 1

KRON, Nov. 17—The \$500,000 addition to Plant Two, of the Goodyear Tire & Rubber Co., will be completed shortly after the first of the year, Goodyear officials said today.

Additional production units will be housed in the new building, largely for the manufacture of mechanical rubber goods.



The late E. C. Howard

Earle C. Howard Dies in Cleveland

CLEVELAND, Nov. 16—Earle Clark Howard, vice-president of the Cadillac Motor Car Co., died here Saturday at noon in the Cleveland Clinic Hospital after an illness lasting several months. Mr. Howard came here from Detroit, hoping to restore his health. He is survived by his widow, a son and a daughter.

Mr. Howard first joined the Cadillac organization in 1906, going to that company from the National Cash Register Co. He entered the sales department under William E. Metzger, advancing rapidly until he succeeded Ernest R. Benson as sales manager. In 1919, Mr. Howard left Cadillac to form the Lafayette Motors Corp., of which he became vice-president and general manager. Five years later, in May, 1924, he joined the Fisher Body Corp. in an executive capacity. In January, 1925, he again joined the Cadillac organization as assistant to the president. Shortly afterwards he was made vice-president.

Mr. Howard was a graduate of the University of Wisconsin and was a member of the Detroit Athletic Club, Detroit Golf Club and the Theta Delta Chi fraternity. The funeral will be held from the family residence 2250 Seminole avenue, Detroit, today. Burial will be in Woodlawn cemetery, that city.

Briggs Income Higher

NEW YORK, Nov. 19—Briggs Manufacturing Company's net income of \$1,025,485 after depreciation, Federal taxes and other charges for September 30 quarter, is equal to 51 cents a share on 1,999,688 no par common shares, against \$1,678,449, or 84 cents a share, in the preceding quarter and \$2,388,816, or \$1.19 a share, in the March quarter of 1925. Net income the first nine months of \$5,092,750 equals \$2.54 a common share.

Cadillac Expands Plant Facilities

\$3,000,000 Being Spent for
Manufacturing and
Retail Additions

DETROIT, Nov. 19—Three million dollars is being spent by the Cadillac Motor Car Co. for additions to its manufacturing and retail facilities in Detroit. Ground was broken yesterday at the company's Clark Ave. plant at the first step in preparing for the present expansion. Announcement of the plans was made by Lawrence P. Fisher, Cadillac president.

The new developments will include assembly and administration buildings at the plant and additions to its retail maintenance buildings on Cass and Jefferson Avenues. Previous developments in the present schedule have been the completion of the new brass, aluminum and iron foundries and the installation of manufacturing equipment. Together, the two improvements will cost \$5,000,000.

The new administration building will release space in the manufacturing buildings, now occupied by the general offices and the assembly unit, of 750 ft. by 125 ft. This will necessitate a complete rearrangement of the interior of the manufacturing buildings for increasing production, which amounted to 3200 for October, 1925.

The present plant, when completed, will be in remarkable contrast to the Cadillac plant of 1921. Then it was scattered throughout the city, located in seventy-seven buildings.

Buick Output to Jump to 1200 Daily

FLINT, MICH., Nov. 15—President Harry M. Bassett, of the Buick Motor Car Co., announces that \$2,000,000 has been appropriated to be used for increasing Buick output to 1200 cars daily. The increase was authorized so that the company would be better able to take care of orders now on hand and being received for the different models.

Company officials stated that it was hoped to begin the increased production by next Summer. The extension work will begin immediately, as will the installation of additional machinery. It is possible that, when completed, the company will be able to bring the yearly output to 300,000 units.

Fastest British Plane Has American Engine

LONDON, Nov. 5 (by mail)—Following the furor which was raised in certain circles in England following the equipment of the Fairey Fox two-seater fighting airplane with an American Curtiss D-12 engine, an announcement has now been made that the Fairey Co. will manufacture the Curtiss engine, or at least sell these engines.

Automotive Steel Demand Unabated

Talk of Price Advances in Sheets Based on False Premises

NEW YORK, Nov. 18—Steel is flowing from mills into channels of automotive consumption at a rate characterized by sales managers of leading steel companies as more than gratifying. Whereas, a few years ago, uncertainty of the demand from the automotive industries was emphasized in the steel market, it is now the dependability and continuity of automotive absorption that are being stressed. So much is this the case that there are rumors of a large merger of independent steel companies, primarily with a view to more efficient competition in the automotive field with the leading interest.

Talk of impending advances in sheet prices continues unabated. These prophecies are based largely on the abnormal conditions surrounding the market for galvanized sheets by reason of the extremely high prices which zinc has commanded of late. Sheet rollers as well as certain consumers have been accustomed for so long to a harmonious set of prices with almost standardized spreads between the base levels for blue annealed, black and galvanized that many have fallen into the habit of believing that when one of these descriptions of sheets advances the others must inevitably follow suit.

Sheet Bar Price Steady at \$35

The tension in the galvanized sheet market results solely, however, from the high prices for zinc, and it is nothing short of absurd, therefore, to predicate predictions of higher prices for sheets, into the manufacture of which zinc does not enter, on the galvanized sheet situation. As a matter of fact, it is significant that in spite of recent advances in all descriptions of sheets, the price for sheet bars holds at \$35. This would seem to denote a program of moderation on the part of those who supply semi-finished material to non-integrated finishing mills. For the present, at least, it would seem as though they intend to refrain from bringing pressure to bear on sheet prices, which they might attempt, if they considered the time opportune, by the simple process of advancing the price for the semi-finished material.

Not all price changes, however, although heralded by the newspapers in flamboyant headlines, denote an actual advance in the steel market. Plates, which in the last few days have improved to the extent of \$1 per ton, are still out of gear with the price for other heavy steel descriptions. In former years plates sold at \$2 above the going price for steel bars. They are at present selling at \$3 a ton below steel bars. Some mills are trying hard this week to lift the steel

bar price from 2c to 2.10c. On Monday large mills were still quoting 2c.

The Metal Markets

Pig Iron—Automotive foundries have been buying fairly good-sized tonnages, and some of the blast furnaces have advanced prices 50c@\$1 per ton. The mercurial character of the coke market and uncertainty over the coal strike outlook engender much caution on the part of sellers as well as buyers.

Aluminum—Routine conditions prevail. Arrivals of imported metal are earmarked against contracts, and resale metal is utterly lacking.

Copper—Any pronounced change in market conditions must be initiated in London where signing of the Locarno pact is looked for as a possible signal for greater activity in the copper market. American consumers are fairly well supplied. The market is easy so far.

Tin—The East Indies and Java permit just enough tin to reach the world's markets to support present high levels. Buying is from hand to mouth.

Lead—Slightly easier conditions prevail. Prices are still abnormally high, but premiums for spot metal are on the wane.

Hardwood Prices Up as Production Falls

ATLANTA, Nov. 17—Hardwood sales to the automotive and body trades in the Northern territory have continued to hold their own in Atlanta and other principal lumber markets of the Southeast the last month. The automotive industry continues to place some exceptionally large orders already anticipating its requirements for the early part of 1926, and buying for this period in a much larger volume than at this time last season.

Production, however, is at a comparatively low ebb in the Southeastern lumber territory, logging being almost at a standstill because of recent heavy rainfall. This is resulting in a shortage of hardwood stocks and giving prices a marked upward tendency.

White ash prices have increased lately, the thicker dimensions primarily used by the auto and body trades now averaging \$130 to \$160 per thousand feet for the 10, 12 and 16 by 4 inch sizes.

Inquiries from the body trades are unusually active, indicating these sales will continue to exceed last year's records for some weeks to come.

Lowell Yarn Co. Buys Tire Fabric Factory

MARSHVILLE, N. C., Nov. 17—The plant and properties of the Marshville Mfg. Co., were recently purchased at a public sale by the Lowell Yarn Co., of New York, according to an announcement by officials of the latter company. The total value of the Marshville plant, which has been engaged in the manufacture of fabric for automobile tires, is given at about \$150,000.

Rubber Shortage in Near Future Looms

Only 3-Month Supply in the World Now Available— Planting Necessary

AKRON, Nov. 17—P. W. Litchfield, first vice-president of the Goodyear Tire & Rubber Co., says that there is now but a three-month supply of crude rubber in the world, and that it takes at least two months to get rubber from plantation to factory. This was cited as the reason why manufacturers are unable to create a surplus stock.

Should Plant Million Acres

He stated further that a million acres of rubber trees should be planted at once, in order to anticipate the world's rapidly increasing demand and to keep down the prices of manufactured rubber goods.

"The Goodyear and United States Rubber Companies entered the plantation project nine years ago," he stated, "and large quantities of crude rubber are being obtained by Goodyear from its plantations.

"Fair profits and fair prices" are predicted by Mr. Litchfield for rubber manufacturers in 1926. He indicated that tires and other finished rubber products would be likely to follow the upward price trend of crude materials.

South America Plans Highway Building

NEW YORK, Nov. 17—H. H. Rice, chairman of the United States delegation which has just returned from the Pan American Congress of Highways at Buenos Aires, reports that Latin America is beginning a program of highway construction which will have a far-reaching effect on foreign trades, and within five years many of the major systems are expected to be under way.

In every city and town visited by the delegation, motor vehicles were in general use and the number of cars is increasing constantly.

Turner Mfg. Co. to Triple Output

KOKOMO, IND., Nov. 17—Construction of a new factory building that will make possible tripling present production has been started by the Turner Mfg. Co., makers of a number of automotive devices. Much larger quarters for the research and engineering departments will be provided by the new plant, in addition to the increased manufacturing facilities, and it is announced that improvements on present products and the development of new devices will be carried on much more rapidly. The new factory will be completed about March 1. The Turner Co. was organized here eight years ago by Earl W. Turner, president and general manager.

Car Makers Study Effect of Tax Cut

Retroactive Clause Needed to Protect Dealers From Loss— Collection Problems

WASHINGTON, Nov. 19—Many interesting problems have arisen in connection with the recommendation by the House Ways and Means Committee of the removal of part of the war excise taxes from automotive products, according to R. A. Brannigan, attorney for the National Automobile Chamber of Commerce, who has been here the last ten days.

One of the most important of these questions is who is to pay the tax on passenger cars, trucks, tires and accessories which the 40,000 dealers will have in stock the day the new law becomes effective?

Admittedly, the purchaser will not pay it. So far as he is concerned, the tax is repealed.

Retroactive Clause Necessary

The answer to the question, according to Mr. Brannigan, can only be met by a retroactive clause in the measure which will permit a rebate to dealers of the stock on hand the day the new tax law becomes effective.

Should the retroactive clause be omitted from the bill it will leave the dealer to "hold the bag" it is declared, unless the manufacturer, of his own accord, rebate to the dealer the amount of tax paid on the equipment in stock the date the bill is effective.

Possible Stagnation Period Foreseen

Another phase of the retroactive clause in the tax bill, insofar as it applies to the manufacturer and dealer alike, will be the probability that, unless the relief is made retroactive, there will be a considerable period of stagnation in sales between the date that the bill passes and the date of its effectiveness.

Should the 3 per cent tax on passenger cars be left in the bill, a change in the administrative features of the tax collection will be asked by the automobile manufacturers.

Under the present law, the tax is based on the chassis and the body, as two separate units. Application will be made to the Treasury Department to collect the tax under the new bill on the completed unit, as it will obviate much needless bookkeeping and accounting between the automobile chassis manufacturer and the body builder.

New Company Buys Laurel Motors Corp.

ST. LOUIS, Nov. 17—Arthur S. Sinclair, former promoter of automobile races at the Creve Coeur track, is the new president of a company which has purchased the Laurel Motors Corp. and its plant at Anderson, Ind. The Laurel Corp. manufactures a special cylinder

KETTERING TO LEAVE MONEY FOR RESEARCH

DAYTON, O., Nov. 18—C. F. Kettering, vice-president of the General Motors Corp., has taken out life insurance in the amount of \$1,600,000, which, at his death, is to become a trust fund to carry on experimental work in the automotive industry. The policy was underwritten by six companies.

Mr. Kettering has long been engaged in automotive research work. Throughout the war, he played an important part in airplane development.

head with 16 overhead valves and other parts which may be used on Fords to increase their speed. The cylinder head was invented by Robert M. Roff in 1917.

Other officers of the Laurel Corp. are: Charles Teutenberg, Norman H. Winter, B. J. Herman and William Schnarr, all of St. Louis.

A St. Louis factory branch of the company has been opened with Mr. Herman as manager. At this branch a Ford racing car fitted with the Laurel cylinder head is on display. This car last year was driven a circuit of the half-mile dirt track at Winchester, Ind., in 27-2/5 seconds.

Mr. Sinclair stated that the Laurel factory at Anderson is to be enlarged.

Kissel "6's" and "8's" Have Sliding Seats

HARTFORD, Wis., Nov. 16—Sliding front seats are new features of the Kissel six and eight-cylinder brougham models. This construction permits easy access to the rear seat without the use of an extremely wide door and, at the same time, makes it possible for the occupants of the front seats to adjust them to their individual requirements.

Instead of being hinged to the floor, the seats are provided with rollers which run in tracks set into the floor of the body. The seats may be locked in any desired position by means of a nicked lever on the front part of the seat.

The advantages claimed for the sliding construction are that the seat on the driver's side being readily adjustable, it can be set at any distance from the steering wheel and pedals and, when a person enters or leaves the rear compartment, the occupant of the right front seat need only slide it forward.

Limousine Body Co. Output to be 35 Daily

KALAMAZOO, MICH., Nov. 16—Nineteen twenty-six promises to be the biggest year in the history of the Limousine Body Co. from the standpoint of production, according to company officials. A minimum average of 35 bodies a day for the next twelve months is the program laid out, and the plant is being rearranged for that purpose.

Car Industry Urged to Invade Aviation

French Ace Thinks Active Par- ticipation Would Be Beneficial

WASHINGTON, Nov. 19—"France excels the United States in both quantity and quality in military and commercial aircraft."

Captain Rene Fonck, French war ace known wherever men fly as the most decorated man of the allied armies, voiced this conviction here this week upon his arrival from Detroit, where he had conferred with Henry Ford and other motor manufacturers. He said, however, that American ships are improving and probably will continue to do so.

While in Detroit, Captain Fonck was the guest of Capt. E. V. Rickenbacker of the Rickenbacker Motor Co., and was shown the sights of the automobile industry in that city. He expressed satisfaction over the work that American manufacturers are doing in the development field of the motor industry and expressed a belief that the more active participation by the motor car industry in the aviation field would be beneficial to the cause of aviation.

"France is ahead," said Captain Fonck, "because she began developing aircraft with a definite policy under air-trained officers immediately after the armistice. Government aid and strict supervision make France lead. Every ship, motor, repair part and pilot in France must pass a stiff governmental test. Many of the aircraft being flown in this country could not pass the French test."

Splitdorf Bethlehem Buys Splitdorf Electric

NEW YORK, Nov. 17—It is reported that legal steps to accomplish the merger of the Splitdorf Bethlehem Electrical Co. and the Splitdorf Electrical Co. are under way, the former company having acquired 98 per cent of the preferred and 96 per cent of the common of the latter. A syndicate headed by Watson & White is expected to offer an issue of stock of the consolidated concern this week. Splitdorf Bethlehem Electrical Co. some time ago took over the business of the Bethlehem Spark Plug Co., Inc.

New Elcar "8" Model to Appear at N. Y. Show

ELKHART, IND., Nov. 18—A new eight-in-line model will be introduced by the Elcar Motor Co. at the New York Automobile Show. Only meager details concerning it are available. It will have a Lycoming engine of the same stroke as the present eight-cylinder model, but with a smaller cylinder bore, and the wheel base will be 124 in. It is expected that the price will be unusually low when considered in connection with the specifications of the new model.

Chrysler Insurance Plan to be Appealed

Decision in Four States to be Carried to Supreme Court for Final Ruling

NEW YORK, Nov. 19—The United States Supreme Court will probably be called upon for a concurrent and final ruling as to the legality of the blanket insurance policy obtained by the Chrysler Sales Corp. under Michigan laws, which covers all Chrysler cars sold between July 1, 1925, and July 1, 1926.

The Federal Courts' decisions on this plan have now been handed down in Wisconsin, Ohio and New York, the latter in Chrysler's favor and the others in favor of the state insurance commissioners. A fourth case is pending in Maine. All cases are expected to be appealed to the Supreme Court for a decision as to what constitutes an insurance agent and whether or not the application of state insurance laws against the blanket policy obtained in Michigan is in violation of the Fourteenth Amendment to the Federal Constitution.

Injunction Application Denied

Application by the Chrysler Sales Corp. for a temporary injunction restraining W. Stanley Smith, Wisconsin insurance commissioner, from threatening to have distributors, dealers and salesmen of Chrysler cars arrested for selling insurance without a license was denied in the Federal Court in Superior yesterday.

Duane R. Dill, who argued this case for Chrysler, when informed of this decision by *Automotive Industries* today, indicated that the decision would be appealed. He holds that the Wisconsin case is the most vital of the four, and that certain state statutes upon which Smith relies are in violation of the Federal Constitution.

Commissioner Retains Supervision

At the offices of James A. Beha, New York insurance superintendent, it was pointed out today that, while the Federal Court's decision here granted the Chrysler interests the right to apply for an injunction restraining Beha from revoking the license of the Palmetto Insurance Co., the decision also sustained the Commissioner's right to maintain supervision over the matter in this case. Beha is expected to apply to the court tomorrow for a re-argument. If this is denied, he will probably appeal to the Supreme Court.

Ignatius, Cabell & Lown are completing the preparation of an appeal from the Ohio decision, which denied the Chrysler application for an injunction against Harry L. Conn, Ohio commissioner. The latter has warned dealers, distributors and salesmen who hold no licenses against selling any insurance on automobiles, whether the premiums are included in the sales price of the car or whether they are part of a separate contract.

G. M. NEW CAR TO BE LOW-PRICED SIX

PONTIAC, MICH., Nov. 18—The new six-cylinder car, to be put out early in January by General Motors Corp. through the Oakland division, according to reports here, will be the lowest-priced six-cylinder car in the General Motors line. Officials of the company say that the addition to its line will be noteworthy for its quality, size and price.

N.A.F.C. Reaffirms Time Sales Stand

(Continued from page 876)

York; C. E. Gambill, president, National Automobile Dealers Association; A. W. Newton, vice-president, First National Bank of Chicago, and A. R. Erskine, president, Studebaker Corp. of America, Mr. Erskine adding that what the manufacturer was interested in was low rates to the consumer, which entailed standard terms and only a fair profit to the finance company. Mr. Gambill favored no-recourse plans as fairer to the dealer and Mr. Newton and Mr. Erskine were inclined to favor recourse.

New directors elected were: Mr. Hare; F. R. V. Williams, Finance & Guaranty Co.; V. G. Dunnington, Manufacturers Finance Co.; A. E. Holton, Holton & Co.; D. L. Barnes, American Investment Co.; E. W. Carter, Carter Guaranty Co.; L. M. Rocheford, Northern Finance Corp., and O. Rey Rule, Pacific Finance Co.

The membership now stands at 265, as compared with 155 who signified their desire a year ago to join the new association.

Department of Commerce Makes Staff Changes

WASHINGTON, Nov. 18—Several important changes in the automotive division of the U. S. Department of Commerce were announced here this week by Acting Chief I. H. Taylor.

F. W. Barker, who has been with the division for about a year, has been appointed to succeed Palmer Elder as chief of the Research Department. Mr. Elder resigned to go with the Dodge Bros., Inc.

N. C. S. Schuette, a graduate of the foreign service school of Georgetown University, will be added to the automotive staff as assistant to both Mr. Barker and to T. Houghton, of Grand Forks, N. D., who has been appointed to direct the work of the Foreign Trade Manual.

The appointment of a successor to Percy Owen, formerly chief of the division, who resigned to take over the foreign sales of Dodge Bros., Inc., has not yet been decided upon by Assistant Secretary J. Walter Drake. The appointment is not looked for, according to Mr. Drake, until about January 1.

Chalfant is Executive Vice-Pres. of N.S.P.A.

Appointment Follows After Convention Asks for Out- standing Figure

CHICAGO, Nov. 17—E. P. Chalfant, whose connection with the automotive industry dates from its early days, today was named executive vice-president of the National Standard Parts Association. Mr. Chalfant's appointment was announced at a banquet tonight after the second annual convention had voted favorably on the proposition to have the office of executive vice-president filled by an outstanding figure.

Mr. Chalfant is president of the Motor & Accessory Manufacturers Association and chairman of the board of directors of the Gill Manufacturing Co. In the early days of the industry he was manager of the Association of Licensed Automobile Manufacturers.

The second N. S. P. A. convention and show opened Monday with 350 delegates attending sessions and 75 exhibitors of replacement parts and shop equipment displaying their products at the show.

A. E. A. Shows Friendliness

The opening session witnessed a gesture of friendliness from the Automotive Equipment Association when several officers and members of the board of directors and prominent members appeared and spoke words of encouragement and good wishes.

The first session included an interesting and exhaustive analysis of the plan of parts distribution which is being used by the General Motors of Canada, by Leroy S. Bennett. Bennett's paper pointed out the fundamental differences of the markets of Canada and the United States due to the wide variance between Canadian and United States car population and trade units, and then proceeded to describe the kind of competition that this car sales organization was offering the independent parts distributor of Canada.

Driver-Harris Buys Electrical Alloy Co.

HARRISON, N. J., Nov. 17—The Driver-Harris Co. here has purchased the works and properties of the Electrical Alloy Co. at Morristown, N. J. The Morristown plant will be operated as the electrical alloy division of the Driver-Harris Co. and the main executive offices and sales department will be concentrated at Harrison.

A larger research and development department will be maintained and the Driver-Harris Co. feels, according to recent statements by officials, that they will thus be able to render a distinct service to the electric heating and allied industries.

Hotchkiss Co. Has New French Plant

PARIS, Nov. 5 (by mail)—A new factory with an area of 323,000 sq. ft., has been erected by the Hotchkiss Co., which, under the management of H. M. Ainsworth, expects to produce 100 cars per week next year. This firm is now the only one in France producing a single model. It has a four-cylinder 3.1 by 4.7-in. engine with overhead valves operated by push rods and rockers. Forged duralumin connecting rods and aluminum pistons are employed and the camshaft and the valve push rods are in an enclosed housing fed with oil from the overhead valve gear. In addition to producing its own engines Hotchkiss will build power plants for the Morris cars, manufactured in the former Leon Bollee factory at Le Mans.

Next year Hotchkiss will be in full production on two or three standard types of Weymann bodies for its own chassis.

German Automotive Men Advocate Time Sales

WASHINGTON, Nov. 19—Negotiations are going on between the Reichsbank and the German automobile industry for the use of Reichsbank credit accounts in selling German automobiles on the installment plan, the automotive division of the Department of Commerce is informed through consular advices. It is stated that 80 per cent of the automobile

GERMAN ASSOCIATION NOT TO RACE IN 1926

BERLIN, Nov. 9—The National Automobile Association adopted a resolution today, according to Associated Press dispatches, that it would not compete in any races in the coming year. Manufacturers are convinced that, in view of foreign competition, they must concentrate all efforts on the reduction of construction costs, and they believe that races not only demand financial sacrifices, but also tend to create serious disorders in the automobile industry.

industry have concluded an agreement with a German-American sales and finance company, whereby this company takes over the financing of automobile sales.

Mexican Duty on Cars Assembled There Lower

WASHINGTON, Nov. 18—The Mexican import duty on separate parts and primary material employed in the construction of automobiles and trucks, provided they are assembled in Mexico, have just been reduced to 5 per cent ad valorem, or one-half the duty on assembled automobiles and trucks. The rate on separate parts not used in construction or assembling remains at 20 per cent ad valorem.

French Automobile Exports Up 35.1%

PARIS, Nov. 4 (by mail)—French automobile exports increased 35.1 per cent during the first nine months of this year, compared with the corresponding period of 1924, while automobile imports into France went up 38.3 per cent. During the first three-quarters of the year, the United States sent 12,669 automobiles into France, while France exported to England, which is her best customer, practically the same number of cars, or 12,386. In addition to this, a big volume of spare parts went into Great Britain.

The total of French automobile exports, exclusive of trucks and tractors, was 42,670, having a value of 1,386,116,000 francs. Following England, Spain was the second best client, taking 5,831 passenger cars; the others in order of importance were Belgium, 5,129; Algeria, 3,638; Germany, 2,272; and Switzerland, 2,258.

French automobile trucks and tractors exported during this period totalled 3,643, with a value of 132,051,000 francs.

Accessories on Cars Dutiable in South Africa

WASHINGTON, Nov. 16—According to the Department of Commerce, the South African commissioner of customs has ruled that automobile accessories, including tires, when attached to chassis, are dutiable separately under the import tariff items.

Developments of the Week in Leading Motor Stocks

NEW YORK, Nov. 18—One must look to the stock market structure itself rather than to any change in the fundamentals of commerce and industry for an explanation of the violent declines recorded in the prices of stocks this week associated with the automotive industry. Stock market history has repeated itself in that an excited public has obligingly taken from the hands of professional operators large quantities of these stocks at prices which, in many cases, are utterly unwarranted either by conditions in the industry itself or in the affairs of the individual corporation.

To say that all automobile stocks were selling at inflated prices would be as great an exaggeration as to say that none of these stocks was selling at a price which fairly represented its value. It is questionable whether General Motors, for instance, in view of its tremendous assets and earning power, and the payment of \$12 in cash dividends during the current year, was over-valued at \$140 per share. Other instances might be cited. But it is equally true that a great many of these stocks were selling at ridiculously high prices, to the accompaniment of equally ridiculous rumors, and those unfortunate buyers who allowed enthusiasm to overcome judgment are paying the usual pen-

alty for their indiscreet investments.

The declaration of the extra \$5 dividend by General Motors was accompanied by an earning statement attesting the remarkably efficient management of that corporation, as well as revealing anew its great earning power. That \$12 per share accounts for only about 60% of the net earnings for this year is in itself testimony to the well-being of the industry as a whole. It is probably true that many stocks in this group have recorded the highest prices which will be seen for a long time to come. But it seems equally certain that the stocks of those companies which are under-valued will presently meet with a demand which will restore them to a price level approximating that value. Hence, there is nothing in the speculative situation to cause alarm to the holders of sound securities.

An increase in the re-discount rate by the Cleveland Federal Reserve Bank, was taken to indicate the intention of the Federal Reserve Bank authorities to apply brakes to the speculation which is rampant throughout the country, not only in the stock market but in real estate. This action, following closely that of the Federal Reserve Bank at Boston, leaves only three Federal Reserve districts with a 3½ per cent discount rate. These are

New York, Philadelphia and San Francisco. It seems probable that with the increase in the commercial demand for credit, these institutions will, in due course, advance their rate to a parity with the other districts. This need cause no alarm.

It is unfortunate that business men in general and the speculative community in particular has come to look upon an increase in the re-discount rate with the recollection of 1920 and 1921 uppermost. There is not now any inflation of prices for goods, and the automobile industry assuredly can testify to the truth of this. Neither is there any undue credit strain, if we consider that approximately two-thirds of a billion dollars of credit has been released to merchants and manufacturers through the increased efficiency of the railroads. The ratio of the Federal Reserve Bank of New York is now about 83 per cent compared with 40 per cent in 1919. Manifestly, the situation is not at all comparable with that of six years ago, when credit was strained.

Just as the over exploitation of the oil stocks last February brought its own correction, so the excited speculation in the motor stocks is bringing its correction. The adjustment may be painful but salutary.—H.H.S.

Crude Rubber Shows Advance to \$1.10

London Stocks Only 4,503 Tons
Compared With 35,589
a Year Ago

NEW YORK, Nov. 17—The advance in prices of original tire equipment of automobile and truck manufacturers, announced as an effort to bring prices of original equipment into line with the prevailing retail tire prices, was accompanied yesterday by the further advance of crude rubber to \$1.10. London rubber stocks, despite the recent increase of ten per cent in production, permitted under the Stevenson Act, declined 402 tons last week to a total of 4,503 tons, compared with 35,589 tons a year ago.

The Rubber Association of America, Inc., reports September production and shipment of high pressure inner tubes as declining from August, with inventories increasing. The same is true of cord pneumatic casings and solid and cushion tires. Balloon inner tube inventories' production and shipments increased, while balloon casings inventory and shipments increased and production declined.

Harvey Firestone, Jr., is quoted as saying in London that the present spread between production cost and selling price can not last long, this opinion being opposed to that held by the London Stock Exchange and rubber experts.

Dura Co. Will Build \$300,000 Toledo Plant

TOLEDO, O., Nov. 18—The Dura Co., manufacturer of automobile window regulators and closed body fittings, has purchased seven acres of land along the Michigan Central tracks on which construction will be started within the next year on a \$300,000 factory, according to company officials. The new plant will enable this concern to confine manufacturing to one instead of two plants. President H. H. Buggie estimates that the new plant will increase output about 50 per cent.

Franklin Raises Output Schedule

SYRACUSE, N. Y., Nov. 19—The entire output of Franklin cars to Jan. 1 was sold out by Oct. 20, according to officials of the company. A production schedule was made immediately effective, it was said, to increase the production to 67 cars a day. The Franklin Automobile Co. has announced the addition of 250 men to its retail sales force in the last two months.

Hupp Eight Sales 13,500 in 11 Months

DETROIT, Nov. 16—Sales of the Hupp eight for the first eleven months of this year will be approximately 13,500, according to O. C. Hutchinson, gen-

eral sales manager of the Hupp Motor Car Corp. Since the reduction in price, the sales have been at a higher rate than they were shortly after the car was introduced.

Officials of the company state that the sales of the Hupp six have been showing a continued and steady gain since its introduction.

Fageol Delivers Bus to Los Angeles Line

OAKLAND, Cal., Nov. 17—The Fageol Motors Co. has delivered to the Los Angeles Railway Co. what is said to be the first gas-electric bus built on the Pacific Coast. The bus is equipped with a Hall-Scott gasoline engine, driving a generator which delivers current to two motors, one on each rear wheel of the vehicle. There is, of course, no transmission and no differential. Speed is controlled by the throttle of the gasoline motor. Sustained speed of 35-40 miles an hour is claimed for the bus. Westinghouse airbrakes are standard equipment, operating from a foot pedal. The bus is double deck, with rear stairway leading to the upper floor, and it seats 68 passengers. It is to be used on a feeder line to the municipal street cars in Los Angeles.

To Ratify Chrysler Stock Split Dec. 18

NEW YORK, Nov. 18—Stockholders of the Chrysler Motor Corp. will meet Dec. 18 to ratify the four-for-one stock split-up plan announced today. Following this formality, it is believed action will be taken regarding cash dividend policy on the new stock. The corporation has more than \$32,000,000 in cash and drafts receivable, and is expected to earn between \$25 and \$30 a share net this year.

The stock change, while it means no essential benefit to Chrysler stockholders, is considered a melon because of the expectation that the new shares will be placed on a cash dividend basis in the near future and that payments will be in the neighborhood of \$12 or \$15 a share on present stock.

The stock split-up announcement had an immediate effect on the New York Stock Exchange. Chrysler common was heavily sold, at one time being 20 points from the high of the day and closing with a net loss of 12½ points. At its low point in the day's trading the stock was down 56¼ points from the year's high of 253.

Miller Announces New Tires

AKRON, Nov. 18—The Miller Rubber Co. last week announced that improved five, six, seven, eight, nine and ten-inch bus and truck tires, which were in production, would be shortly available to the public.

FINANCIAL NOTES

Continental Motor Corp.—While the annual report of this corporation will not be made public until about the end of the year, it is reported that operating profits for the fiscal year just closed, October 31, exceeded those of the preceding fiscal year, when a net of \$1.43 a common share for 1,760,845 shares was shown. Net for current year is estimated at \$1.65 a share.

Company has \$6,000,000 cash and no bank loans. Its truck and bus engine business is growing and good strides are being made in development of business in the industrial gas engine field.

Mack Trucks, Inc.—Directors of this company have declared a stock dividend of 50 per cent on the common stock, payable Dec. 31 to holders of record of Dec. 15. A special stockholders' meeting had been called for Dec. 4 to increase the common stock by 224,429 shares.

"Due to the continued growth of the corporation," a statement said, "the board of directors believe at the meeting so called they authorized the number of shares of common stock without par value should be increased from 500,000 to 1,000,000 shares, the increased number of shares beyond those necessary to pay the stock dividend, to be available for future corporate purposes, and when issued, to be offered to common stockholders pro rata."

Electric Auto-Lite Co.—This company, for first ten months this year, reports net profit \$2,367,017, after interest and depreciation, against \$1,274,942 in same period last year. October net profit was \$290,054 against \$117,469 in the same month of 1924. Ten months' net profit equals \$9.47 earned on each of 250,000 no par common against \$5.09 in the 1924 period. Current assets Oct. 31 were \$2,749,700 and liabilities \$567,063.

McCord Radiator & Manufacturing Co.—Net income for third quarter this year was \$264,368, after taxes and charges, against \$147,785 in the third quarter last year. For the first nine months of 1925, net income was \$790,654, compared with \$654,983 in the same period of 1924.

Wickwire-Spencer Steel Co.—This company and subsidiaries for the nine months ended Sept. 30 report net loss \$90,911 after depreciation, interest, etc. Third quarter net loss was \$346,174 against net profit of \$80,381 in the preceding quarter and net loss of \$249,989 in the third quarter last year.

Timken Roller Bearing Co.—This company has declared an extra dividend of 25 cents, and the regular quarterly dividend of 75 cents, payable Dec. 5 to stock recorded Nov. 20. This is the same dividend rate paid in preceding quarters.

Goodyear Tire & Rubber Co. of Canada, Ltd.—This company reports, for the year ended Sept. 30, net income of \$1,049,440, after expenses, taxes and depreciation, against \$837,734 in the previous year.

A. O. Smith Corp.—The New York Stock Exchange has admitted to its list \$4,725,000 10-year first (closed) mortgage 6½ per cent gold coupon bonds of this company, due May 1, 1933.

Men of the Industry and What They Are Doing

Prest-O-Lite Changes

M. J. Carney has been elected chairman of the board of directors of the Prest-O-Lite Co., Inc. He formerly was vice president. William F. Barrett, also a former vice-president, has been elected president. Ralph R. Browning is now vice president in charge of acetylene sales and R. J. Hoffman has been re-elected vice president in charge of storage battery and automotive divisions.

Flint Appointments

W. O. Crabtree, sales manager of the Flint Motor Co., has announced the appointment of George R. Morris as assistant sales manager. L. F. Barrett has been appointed regional manager for Eastern territory, with headquarters in New York. J. H. Lucas has been appointed regional manager for the South-eastern territory, with headquarters in Atlanta, Ga.

Erwin Resigns Vice-Presidency

W. B. Erwin, Minneapolis, has resigned as vice-president and director of The Paraflactor Co. His resignation is effective December 15. He plans, however to remain in the automotive industry. He came to the Paraflactor concern more than a year and a half ago as sales manager. He was formerly vice-president of the H. L. Rackliff Co. of Cleveland, automotive marketing counselors.

Helser Made Treasurer

V. E. Helser, formerly purchasing agent for the Gramm-Bernstein Truck Corp., has resigned to become treasurer of the Buckeye Hardwood Lumber Co., which has opened a wholesale hardwood lumber yard in Lima, O., to serve the automotive trade with Northern and West Virginia hardwoods.

Nicar General Superintendent

Edward Nicar, formerly connected with the Firestone Rubber Co., Akron, has been made general superintendent of the Lambertville Rubber Co., Lambertville, N. J. He takes the place of F. W. Bommer, resigned. The concern is controlled by the Goodyear Rubber Co.

Hodgkins and Morgan on Tour

R. T. Hodgkins, general sales manager of the Rickenbacker Motor Co., of Detroit, and F. N. Morgan, district sales manager, were in St. Louis last week on an inspection tour of distributing agencies in the middle west.

Shobe in Mexico

V. I. Shobe, assistant general manager of the Zenith-Detroit Corp. is in Mexico making an extensive investigation of trade conditions in that country. The trip will take approximately a month.

CLYDE PRESIDENT OF CARNEGIE STEEL CO.

W. G. Clyde has been appointed president of the Carnegie Steel Co., Pittsburgh. Mr. Clyde was formerly sales manager of the American Steel Hoop Co., Philadelphia, assistant general sales manager of the Carnegie Steel Co., and has been vice-president and general sales manager of the latter company since 1918. He is a director of the Bank of Pittsburgh, of the U. S. Steel and the Carnegie Pension Fund, and a member of numerous clubs.

Hibbard Sales Manager

J. L. Hibbard, foreign sales manager of the Studebaker Corp. of America from 1913 to 1918 and then foreign service and district sales manager of the Cleveland Tractor Co., has been appointed assistant sales manager of the Rickenbacker Motor Co. He will also have charge of export sales. Mr. Hibbard was at one time general manager of the Maxwell-Chalmers Co., of Canada.

Board Reelected

At the annual meeting of the stockholders of the C. G. Spring & Bumper Co., of Delaware, the board of directors was re-elected. At a subsequent directors meeting, the following officers were elected for the coming year: president, Christian Gird; vice-president, Chas. Getler; vice-president and secretary, F. A. Cornell; treasurer, M. D. Harrison.

Wolfers Goes to McGraw-Hill

Robert Wolfers, for more than twenty years identified with the publication of automotive periodicals, and known to many in the industry as formerly manager of the Directory Department of the Chilton Class Journal Co., has joined the McGraw-Hill Co., and will be in charge of the directory department, which has recently been organized to serve McGraw-Hill advertisers.

James New Works Manager

William M. James, formerly superintendent of the Walker-Vehicle Co., of Chicago, has accepted a position as works manager with the Kearney & Trecker Corp., Milwaukee, Wis.

White on Business Trip

R. K. White, head of the Chevrolet sales promotion department, is on a business tour of Chevrolet agents on the Pacific Coast, and will remain in the West until shortly before Christmas.

Cline to Cleveland

Stanley C. Cline, sales manager of the Gabriel Snubber Co., distributors of Gabriel snubbers and Perfection heaters in Northern Illinois and Indiana, will leave the Chicago company about December 1 and go to Cleveland as assistant sales manager of the Gabriel Snubber Manufacturing Co. Arthur E. Holm will take Mr. Cline's place when the latter goes to Cleveland.

Artman Sales Agent

A. J. Artman, formerly district sales agent for the West Leechburg Steel Co., Pittsburgh, has been appointed sales representative for the C. G. Spring & Bumper Co. of Michigan. Mr. Artman takes over some of the duties of L. J. Schneider, who lately resigned. Mr. Artman has been for some time engaged in solicitations to automotive manufacturers.

Linde Air Products Changes

G. W. Mead, formerly president, is now chairman of the board of directors of the Linde Air Products Co., and W. F. Barrett, formerly vice president, has been elected president. R. R. Browning is vice president in charge of sales and J. A. Raffert is vice president in charge of engineering, manufacturing and research.

Bailey to California

H. D. Bailey, advertising manager of the International Motor Co., New York, has gone to California for an indefinite period. At the company offices it was said that he had not resigned, but retained honorary title of advertising manager. His work here is now being handled by A. D. Lierman.

Calhoun Returns to Lansing

George Calhoun, of the export division of the Reo Motor Car Co., has returned to Lansing after a three months' trip abroad. He visited many of the Continental countries, both in the North and South.

Heinze on Northern Trip

John O. Heinze, founder of the Heinze Electric Co., Lowell, Mass., who started in the industry in 1891, has been sparing a few weeks from his orange grove at Loveland, Fla., renewing acquaintances in Detroit and other cities.

Appointed Sales Representative

Theodore L. Dodd & Co., Detroit, has been appointed sales representative of the Seamless Tube Co. of Wisconsin, Appleton, Wis., at which latter point the company has recently opened up a tube mill.

Ayres Warns Against Easy Time Sales

Smaller Down Payments and Longer Terms Economically Unsound

CLEVELAND, Nov. 18—With some successful automobile dealers in this city advocating a smaller down payment on the purchase of cars and a longer period for paying the balance—two years, if possible—and with some of the leading department stores adopting the 10-payment plan for buying everything from furs and overcoats down to shoes, Col. Leonard C. Ayres, well-known business statistician, has sounded a note of warning in the business bulletin of the Cleveland Trust Co.

"There are at least three important elements of weakness in the situation. The first is the obvious danger that exists when millions of people of slight financial means have mortgaged their future incomes for present satisfaction. The second lies in the personalities of the organizers and executives of many of the new finance companies. The business is one that calls for the cold, impartial credit judgment of the hard-boiled commercial banker. The newer companies have been organized largely by men who are salesmen and promoters. They have been notably successful when prosperity has been general and competition easy and cheap. It is to be doubted if they can be equally fortunate when these conditions change. The third and probably most important problem is that the operations of these companies are made possible by credits extended by banks on terms that will certainly have to be made more rigorous whenever interest rates advance to higher levels."

Three of the largest department houses in Cleveland have made it possible for a patron to get a credit slip of from \$200 to \$300, then take it to each department where they need goods, buy anything from a toothpick, comb, pair of shoes, dress and hat to higher-priced articles, pay down a small amount and the balance in ten installments. This is an adaptation of the automobile industry's financing of car purchases.

75,884 Miles Included in New Highway System

WASHINGTON, Nov. 19 — Three transcontinental highways were designated by Secretary of Agriculture Jardine this week to be marked by uniform signs to guide motorists. One route will be from Boston to Portland, Ore.; another from Baltimore to San Francisco, and the third from Savannah to San Diego.

Approval also was given by him for the uniform marking of 142 other highways connecting distant cities by the most direct routes. In all 75,884 miles

REO CUTS TOURING MODEL PRICE \$200

LANSING, MICH., Nov. 15—

The Reo Motor Car Company has announced a price cut of \$200 on the Sport Touring model on its "T-6" chassis. This model, which was formerly listed at \$1595, now sells at \$1395.

of roadway were included in the new system, to be known as the United States Highways.

The plan approved was worked out by the Joint Board on Interstate Highways, composed of 24 State and Federal highway officials. This board held regional meetings throughout the Summer and Fall to develop the system.

Each route is assigned a number. Roads running North and South will be given odd numbers, and those running East and West even numbers. Danger and caution signs to be used will be of four different shapes, representing as many degrees of danger, and all having a yellow background with black letters and symbols. Another group of signs will include standard route markers in the form of a United States shield and directional and informational signs, all to have a white background with black lettering.

American Tire Co. Resumes Operation

AKRON, Nov. 17—Completion of a \$1,000,000 new financing program will enable the American Rubber & Tire Co. to increase its tire manufacturing operations considerably, according to President F. C. Snyder.

Operations were resumed last week after a shut-down of the plant for the last four months. Orders on hand are sufficient to enable the company to run for two months, Snyder stated, and preparations are being made to increase working forces.

A \$500,000 bond issue has been floated to liquidate the greater part of the concern's current liabilities. Debentures totalling another \$500,000 have been lifted by issuing preferred and common shares in their stead. Creditors, for the most part, accepted bonds of the company for their accounts, and additional funds for working capital, raised by stockholders, are secured by the stock issues.

Fuller & Sons to Sell Transmission Parts

KALAMAZOO, MICH., Nov. 19—Fuller & Sons Mfg. Co. has announced to its distributors of Model No. 4 transmission that parts will shortly be furnished by the factory, which will make it possible to install the Fuller auxiliary transmission in connection with any make and size of Ford truck frame extension

A. A. A. Leads Fight Against Car Taxes

Repeal Would Benefit 17,500,000 Whereas Income Tax Cut Would Affect 4,000,000

WASHINGTON, Nov. 18—With the hearings before the House Ways and Means Committee out of the way, the necessity of intensive personal contact with members of the House and especially the committeemen is now being emphasized by the A. A. A. and other organizations. There is still time for individuals in the automotive industry, as well as motorists, to be heard, but there is no time to lose if their voices are to be effective in the committee's framing of the tax reduction bill.

Majority sentiment on the committee appears to favor the application of \$200,000,000 of the available Treasury surplus to the reduction of income and inheritance taxes. This would benefit only 4,000,000 taxpayers. There are 17,500,000 motorists who would benefit from the repeal of the war excise taxes on motor vehicles, accessories and parts. The tentative program would leave only \$100,000,000 available for reduction of all other sources of revenue for which the committee heard demands. Automotive tax relief on this basis would certainly not measure up to the needs and demands of car owners and the automotive trade.

Thus, all owners and individuals in the trade are being urged to get into touch immediately with their Senators and Representatives in the interest of complete repeal of the excise automotive taxes, chiefly because, if the fight for complete repeal is lost in the committee, it will be much more difficult to win on the House and Senate floors.

Planes to be Exhibited at Los Angeles Car Show

LOS ANGELES, Nov. 19—For the first time in the West, airplanes will be exhibited at an automobile show when the Los Angeles Motor Car Dealers Association conducts its annual exhibition in February. Burt Roberts, executive secretary of the association, says that the marked interest in aviation in California caused the executive board of the organization to invite participation of the airplane industries at this year's show.

"The rapid progress being made in aerial transportation, especially in Southern California," says Mr. Roberts, "has prompted a number of progressive business men to establish distributing and service plants for airplanes in this territory. More and more individuals are investigating the practicability of air travel every day, and the time is opportune to begin a definite program, looking toward the general public introduction of various airplane models for private operation."

Coming Events

SHOWS

- Nov. 15-21—New York, Automobile Salon.
- Nov. 16-21—Detroit, First National Motor Bus Show.
- Nov. 26—Dec. 6—Berlin, Germany, Annual Automobile Show in the Kaiserdamm.
- Dec. 7-20—Buenos Aires, 8th Annual Argentine Automobile Show.
- Jan. 9-16—New York, N.A.C.C. National Annual Show, Grand Central Palace.

- Jan. 18-23—New York, Twelfth National Motorcycle, Bicycle and Accessory Show, New Madison Square Garden.
- Jan. 30-Feb. 6—Chicago, N.A.C.C. National Annual Show, Coliseum.
- Jan. 30-Feb. 6—Chicago, Automobile Salon, Hotel Drake.

CONVENTIONS

- Nov. 16-21—Detroit, Society of Motor Transportation Engineers.

- Nov. 18-21—Detroit, American Association of State Highway Officials.

- Jan. 9-16—New York, Second World Motor Transport Congress, Roosevelt Hotel.

- Jan. 21-22—Hotel Statler, Buffalo, N. Y., Winter Sectional Meeting, American Society for Steel Treating.

RACES

- Nov. 26—Los Angeles.

S.A.E. MEETINGS

Sectional

- Nov. 19—Cleveland.
- Nov. 20—Washington, D. C., Cosmos Club.
- Nov. 20—Chicago.
- Nov. 24—San Francisco, Engineers Club.
- Dec. 10—Indianapolis.

National

- Jan. 14—New York, Annual Dinner, Hotel Astor.
- Jan. 26-29—Detroit, Annual Meeting.

Coming Feature Issues of Chilton Class Journal Publications

January 1—Automobile Trade Journal—National Shows Number.

January 7—Motor Age—National Shows Number.

January 14—Motor World Wholesale—New York Show Report.

February 4—Motor Age—Chicago Show Number.

February 4—Motor World Wholesale—Chicago Show Report.

February 18—Automotive Industries—Statistical Issue.

Seventy Exhibit at National Bus Show

Truck, Bus and Accessory Manufacturers Display—Conventions Held

DETROIT, Nov. 16—The first motor bus show to be held by bus and accessories manufacturers opened Saturday evening at Convention Hall, under the title of the First National Motor Bus Show. At the originating of the show, less than six weeks ago, it was planned to make it an annual event. The opening session, and the enthusiasm with which it was marked, makes this seem an assured event.

Sixty manufacturers, whose business is either the manufacturing of buses or the making of accessories, had booths tonight. Then there were firms which, while not directly connected with the industry, are closely allied to it. All told, there are more than 70 firms exhibiting.

The list of accessory manufacturers include those making ignition systems, tires, batteries, carbureters, magnetos, gears, bodies, brakes, tools, lubricating systems, springs and bumpers. They come from thirteen different States.

In addition to the show, four conventions directly connected with the bus industry will be held. They are: Michigan Highway Transportation Association, the American Association of State Highway Officials, Society of Motor Transportation Engineers and the National Motor Bus Association.

Besides the bus and accessories displays, there will be special exhibits, including a Stout monoplane shown by the Ford Motor Co., and Gar Wood's motorboat, Miss America.

"The bus show which opened tonight is to the bus manufacturers and acces-

sory makers what the N. A. C. C. shows in New York and Chicago are to the passenger car manufacturer," C. E. Stone, chairman of the general committee, said. "From now on, every year in the future, the show will be held here and you may be certain that it will be the best that the manufacturers know how to put on."

S. A. E. to Discuss Cylinder Finishing

NEW YORK, Nov. 16—Lapping and stoning automobile cylinder bores, over which there is considerable difference of opinion, will be discussed at the meeting of the Detroit Section, Society of Automotive Engineers, Dec. 17, at General Motors Building. Papers setting forth favorable and unfavorable experiences along this line will be presented by representatives of the Hupp, Ford, Continental, Packard, Paige Detroit, White, Chrysler, Dodge and Wilson Foundry and Machine factories.

Herbert Harrison, president of the Harrison Radiator Corp., will discuss steam cooling.

Highway Research Meeting Dec. 3-4

WASHINGTON, Nov. 16—The Highway Research Board of the National Research Council announced this week that the fifth annual meeting of the Board will be held here Dec. 3 and 4. The sessions will be held in the National Academy of Sciences of the National Research Council. The Executive Committee, in charge of the program, is A. N. Johnson, chairman; W. M. Connell, vice-chairman; T. R. Agg, A. J. Brosseau, H. C. Dickinson, Thomas H. MacDonald and W. Spraragen.

U. S. Under A.A.A. in Foreign Racing

Suggested Change Would Allow European Recognition of American Records

PARIS, Nov. 5 (by mail)—American automobile records doubtless will obtain European recognition by reason of the action taken by the International Association of Recognized Automobile Clubs at its annual meeting just held here. This gathering voted a change in the statutes by which a National club will have the right to delegate any part of its powers to another club or association.

The United States has always been represented in Europe by the Automobile Club of America, which, having no control over racing, avoids discussion on this subject, and neglects to submit American records for European and world recognition. The rules of the International Association having been changed, it is understood that the A. C. A. will transfer its sporting representation to the American Automobile Association, the practical outcome of this being that American speed records, which at present have no standing in Europe, will obtain international recognition.

Radiator Capacities' Chart Just Issued

NEW YORK, Nov. 19—A cold weather chart of radiator capacities of all makes of cars and the amounts of distilled glycerine required as an anti-freeze solution has been published by the chemical research division of Proctor & Gamble Co. and issued to members of automobile clubs.

AUTOMOTIVE INDUSTRIES

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NUMBER 22

Rates, Not Terms, Principal Issue Now Among Automobile Finance Men

Talk at Chicago meeting centers around possible effect on profits
of factory tie-up plans. Committee will be named to
discuss problem with car manufacturers.

By John C. Gourlie

ONE fact stood out above all others at the annual convention of the National Association of Finance Companies in Chicago, Nov. 16 and 17—that to the finance companies today the important question is rates, not terms.

The avowed main purpose of the convention was to consider how terms could be stabilized on a sound basis for the good of the industry and the public, but aside from the scheduled speeches, little attention was given this matter by the delegates, who quickly turned to an excited discussion of the new low rates and their effects on the finance companies, the manufacturers and the public.

The position taken by the same group a year ago—that sound terms meant adherence to the standard of one-third of the cash price down and the balance in twelve equal monthly instalments on new cars and 40 per cent and 12 months on used cars—was finally reaffirmed, but in the minds of most of the delegates present the only really significant action taken by the convention was the approval of a resolution calling for the appointment of a committee to discuss rates with the car manufacturers.

It was clearly revealed that the plans recently effected by several car makers with large finance companies for the handling of retail instalment selling and insurance had caused a disturbance of major proportions among the companies that had no direct

relations with the factories. Under these plans finance and insurance rates have been reduced, and the "outside" companies are faced with a form of competition that a few months ago they felt little, if at all.

So long as the main form of competition was in terms, anyone could enter the game, and if long periods for settlement of the unpaid balance, and low down payments, led to more repossessions and greater losses the rates were gaily marked up and the public, as usual, footed the bill.

Rapid changes have gone on this year. The dealers have been under pressure from the factories, and now,

to an extent, from the public, to offer low terms of financing and insurance. Through the dealers, the pressure is being exerted on the finance companies, who, in many instances, have been obliged to lower their rates. Now lower rates, without a corresponding tightening of terms, are working a hardship on many of the smaller companies, and they have been passing out in large numbers, some liquidating and others being bought up by financially stronger concerns.

This is the picture as it appeared at the Chicago convention. But it does not fully express the utterly chaotic condition of the financing business—its lack of leadership and its inability, in its present disorganized condition, to grasp the fundamentals of its problems and make some attempt at a solution.

Three Principles for the Guidance of Instalment Financing

THE following principles for the guidance of instalment financing were suggested by Henry Ittleson, president, Commercial Investment Trust Co., during the recent convention of finance companies, with which this article deals:

1. A purchaser should not acquire a motor car if the depreciation during the first 12 months exceeds 15 per cent of his annual income.
2. No purchaser should be induced to acquire too costly a motor car by the deluding invitation of small monthly payments, extended over many extra months. His depreciation loss would be too excessive.
3. No motor car should be entrusted to an individual unless his initial investment is sufficiently large to make him feel that he owns the automobile. Insufficient down payment does not encourage proper care of the collateral.

High hopes are held for the committee which will deal directly with the manufacturers. The members of this committee will bear the grievances of the outside companies and their criticisms, right or wrong, of the present course of financing under the policies of the producers. The message they will present will run somewhat along these lines:

"From 60 to 75 per cent of the automobile retail time sales financing is done by the companies that have direct relations with the factories. These companies are performing an indispensable service, covering local territories with satisfaction to the dealer and public that the large national companies cannot hope to equal.

See Shortage of Capital

"Yet through your factory arrangements with the large companies you are placing an intolerable burden on the 'independent' company. Under the rates established in your plans even the large companies cannot obtain the necessary capital for expansion if they are going to have to replace or take over the local companies. You will find that in the end you must either obtain the capital yourselves for the finance companies or permit them to advance their rates.

"In the meantime the business of your own dealers will be going largely or entirely to one finance company. This company, if its independent local competition is removed, will have an enormous power over the formulation of your sales and production policies, for the agency that can control time sales of automobiles can come close to controlling the whole business. Do you want to follow the orders of a finance company with its banking connections?

"The finance companies could make a good profit under the rates that were more or less universal until recently. Some of the better organized of them can still make a little money. But we have to look at this business as a long range proposition. Times are good now; they may be bad in a few months or a year or two, and then our losses will increase and we will have urgent need of the surplus we have been able to build up during the good years when there is large volume, comparatively few repossessions and a good used car market. This is also the situation with respect to the companies with which you have made arrangements. Do you want to see them in difficulties when the turn comes?

Won't Surrender Without Struggle

"The independent finance companies are not going to see their business go without making a struggle. The stronger ones, if present tendencies persist, will sooner or later go direct to the public and offer to lend car buyers a portion of the sum needed to pay cash for a new car. This will be expensive for the finance company, but it will be able to offer terms and other inducements that the company with which you are affiliated cannot meet. In this event again your efforts will be undermined.

"Don't you think, then, you ought to reconsider your arrangement with the finance company?"

This solicitude of the finance companies for the well-being of the manufacturer would appear to be a trifle belated. What the companies failed to foresee and what they do not even now give sufficient weight to is the desire of the manufacturer to bring down costs to the purchaser. If the finance companies had held down their terms and operated efficiently at only a fair profit the evils that have grown out of financing and insurance would never have made their appearance and there would have been no such formidable drive to cut down rates as was launched this year.

A mild sensation was caused during the discussion of

rates when E. S. Hare, vice-president, Hare & Chase, Inc., declared that some of the finance companies might be receiving "subsidies" from the factories. Although this remark was applauded, inquiry among the men in attendance showed that by no means all of them believed in the truth of the assertion.

Speakers on the opening day of the convention were all emphatic in decrying the trend toward smaller down payments and longer periods of payment. Said A. R. Erskine, president, Studebaker Corp. of America:

"In the competition for business this year, some finance companies have violated the terms and conditions of the resolutions passed by the association last year. Whether these violations were dictated by automobile manufacturers or were voluntarily introduced by the dealers or finance companies is immaterial. Violations are finding extreme expression in down payments as low as 20 per cent of the cash delivered price, and as high as twenty-four months for the deferred balance.

"These extreme risks necessitate heavy finance charges to cover repossessions which probably reach 10 per cent of the transactions handled. On a flat interest basis, these charges run from 20 to 30 per cent per annum, in addition to which insurance charges are added, and the consumer must groan under the burden. The good risks who pay out their contracts are compelled to pay exorbitant rates for credit. Low down payments barely cover the financing and insurance charges and leave buyers with but little equity in the cars. Most persons whose cars are repossessed are changed from friendly customers to bitter 'knockers.' They damage the good will of both manufacturer and dealer.

Paper is Prime Security

"Many unsound transactions are on a non-recourse basis, which tends to make dealers careless as to risks and to undermine the integrity of all automobile paper. Banks which finance this unsound paper usually require additional security or collateral to protect them against loss. But, on the whole, it may be said that the unsound practices which have been dwelt upon constitute but a small percentage of the automobile financing business. Based upon the records it is an assured fact that automobile paper, secured by standard makes of cars, sold on sound terms, endorsed by dealers and guaranteed by strong finance companies, constitutes prime security for bank loans and that the national average losses upon such paper are less than one-quarter of one per cent."

He closed with a vigorous defense of instalment selling on a sound basis.

C. E. Gambill, president, National Automobile Dealers Association, agreed with Mr. Erskine and the others as to the standards of soundness so far as terms were concerned, but he spoke in favor of non-recourse as fairer to the dealer. Mr. Gambill said in part:

"Automobile manufacturing plants have been built up to a capacity of around 6,000,000 units a year. Even with the unprecedented business of 1925 this means that actual production was only about 70 per cent of productive capacity. There is a tremendous temptation to automobile manufacturers to keep plants operating at full capacity, because the nearer this can be done, the more certain is the manufacturers' control over his production costs and the certainty of his profits.

"Delivery movements based upon unsound time payments may be an impetus which seemingly will further the tendency of instalment selling to flatten out the peaks, but in our opinion such deliveries themselves are filled with more danger than the seasonal slackness of sales themselves. It is the repossession danger which

Tabulation of Average Experiences Based on One Year's Record of Many Automobile Finance Companies

	Losses on Repossessed Cars			Repossession Ratio New Cars			Rep. Ratio Used Cars		Used Cars	Per Cent of	Special Paper	
	12 Monthly Payments	16-18 Monthly Payments	19 or more Monthly Payments	1/3 Down Payment	1/4 Down Payment	24% & Less Down Payment	40% Down Payment	36% & Less Down Payment	Paper % of Total	Companies Requiring Dealers Endorsement Used Cars	13 or more Monthly Payments	35% Used 25% New Down Payment
Average	\$50	\$78	\$220	1 1/4 %	3 8/10 %	11 %	3 %	6 1/6 %	31 %	94 %	18 1/3 %	19 1/3 %
Loss Ratio 12 Months.....	...	...	...	.163 %	.36 %	1.041 %	.536 %	1.1 %	...	...	...	...
Loss Ratio 16-18 Months....	...	...	...	.254 %	.563 %	1.625 %	.839 %	1.716 %	...	...	...	...
Loss Ratio 19 or more Mths.	...	...	...	.716 %	1.587 %	4.583 %	2.537 %	4.84 %	...	...	...	...

is feared by every substantial dealer in the business today.

"In this connection we will say that we believe it is extremely unwise and a matter of poor business practice for either manufacturers or finance companies to insist upon dealer endorsement of finance company paper without also permitting the dealer to set up a reserve against the possibility of repossession and resale. If the dealer is to be a guarantor of the integrity of the buyer, then he should be allowed a guarantor's privilege of a reserve for such endorsement.

"Automobile discounts to dealers today are practically the same that were fixed in the days when fully 95 per cent of automobile sales by the dealer were for cash. Conditions radically different from those of the early days have crept into automobile merchandising and the dealers' margin between gross discount and net profit is today a very narrow one. That original discount never contemplated the time payment business as it now exists, and certainly no provision was made in the original discount to cover the item of guarantee of time paper.

Dealers' Endorsement Undesirable

"Indeed careful reflection would indicate that the most desirable handling of this paper from the dealers' standpoint is for finance company acceptance of it without endorsement from the dealer at all. Dealers are constantly contending with the commercial bankers for adequate credit requirements and one of the most serious of these handicaps is the view which the banker takes toward the contingent liability of the dealers' endorsed paper."

An interesting view of why bankers prefer short term paper came from A. W. Newton, vice-president, First National Bank of Chicago. He said:

"From my viewpoint it is unsound for any concern to borrow from a bank at six months where the underlying collateral does not largely liquidate itself during the period of the loan, as, of course, paper with a minimum maturity of twelve months would do. Certainly the finance company which only took twelve months paper, if asked to pay its notes as they matured, could do so by stopping its purchases, using its cash, and liquidating its surplus collateral, if shown a little indulgence by its bankers.

Damages of Long-Term Papers

"This it quite as certainly could not do if its paper ran for as much as twenty months. Besides, if really bad times came to this country and defaults in payments became very heavy, the conservative company would be more likely to liquidate a large volume of its paper without undue loss than would the company which had

accepted considerably longer terms. Then too, the more severe the depression in business the more difficult it would be to sell repossessed cars."

Mr. Newton said there was no possibility of the banks acting together to enforce sound financing terms, but each case would be considered on its own merits.

No exception was taken to the support given by the various speakers to standard terms. But the delegates were frank in expressing their conviction that under present competitive conditions there was no possibility of anything approaching general observance of the standard. An effort was made to pass resolutions that would have permitted a slight modification of the one-third down and twelve months' payment terms on a certain proportion of the finance companies' business, but this was tabled virtually without discussion, the delegates evidently feeling that even the modified program would not be followed.

So it was somewhat with tongue in cheek that last year's resolutions were reaffirmed.

Hanch Shows Survey Results

C. C. Hanch, general manager of the association, presented the results of a survey undertaken by the association which showed strikingly the gain in losses and repossessions as the down payment was lowered and the period for payment extended. The survey was also intended to show the proportion of special paper handled by the finance companies, but it is doubtful whether the companies replying to the questionnaire were typical enough to give a fair average. Mr. Hanch's figures in this respect showed paper calling for more than 12 equal monthly payments is now 18 1/3 per cent of total paper handled and paper with a down payment of 25 per cent or less on new cars, and 35 per cent or less on used cars is 19 1/3 per cent of total paper handled. This does not imply that more than 37 per cent of the paper of the companies reporting is special, as in most cases where the note is special in one respect it is also in the other.

The arguments for and against recourse on used car paper were conducted by Mr. Hare, for non-recourse, and A. J. Morris, president, Industrial Acceptance Corp., for recourse.

AN all-metal flying boat has been built for the British Air Ministry in Copenhagen by the Rohrbach Metal Airplane Co. of Copenhagen and Berlin. The machine recently made the flight from Copenhagen to Felixstowe, England, a distance of 600 miles, without stop. One of the features of the machine is a three-part wing construction and another the provision of telescopic masts and sails. Similar machines are said to be in construction at the Dalmuir works of Wm. Beardmore & Co., Ltd.

Three New Chassis Make Appearance at Detroit Bus Show

Gotfredson introduces six-wheel job, Dorris brings out a gas-electric and Denby has new heavy-duty model.
First National Exhibit proves success.

SIXTY-EIGHT exhibits, eleven of which were of bus chassis, were viewed by a representative crowd of bus operators as well as by the general public at the First National Motor Bus Show held in Detroit, Nov. 16 to 21.

The eleven makes of buses shown were typical of the latest developments in design, all except three or four of the prominent producers being represented. Leading makers exhibiting included American National Omnibus Co. (Tillings-Stevens bus), Chevrolet Motor Car Co., Commerce Motor Truck Co., Denby Motor Truck Co., Dorris Motors, Inc., The Fageol Co., Gotfredson Corp., Graham Bros., Reo Motor Car Co., Studebaker Corp., and Yellow Coach Manufacturing Co.

Body builders showed their products on various types of chassis including International Harvester and Six Wheel, as well as on those chassis previously mentioned.

Three new chassis appeared at this Detroit show in addition to the models which already had been exhibited in a previous show. The newcomers were a Gotfredson six-wheel model carrying a six-cylinder Buda engine; a gas-electric design shown by Dorris and a Denby 25-30 passenger conventional heavy bus chassis carrying a 6-cylinder engine.

It can be said fairly that this First National Motor Bus Show was a success from the standpoint of the bus exhibitors, although most of the attendance was from the Michigan territory.

There was a very general feeling, however, among all

the exhibitors that as a pioneering effort the results achieved were praiseworthy and satisfactory.

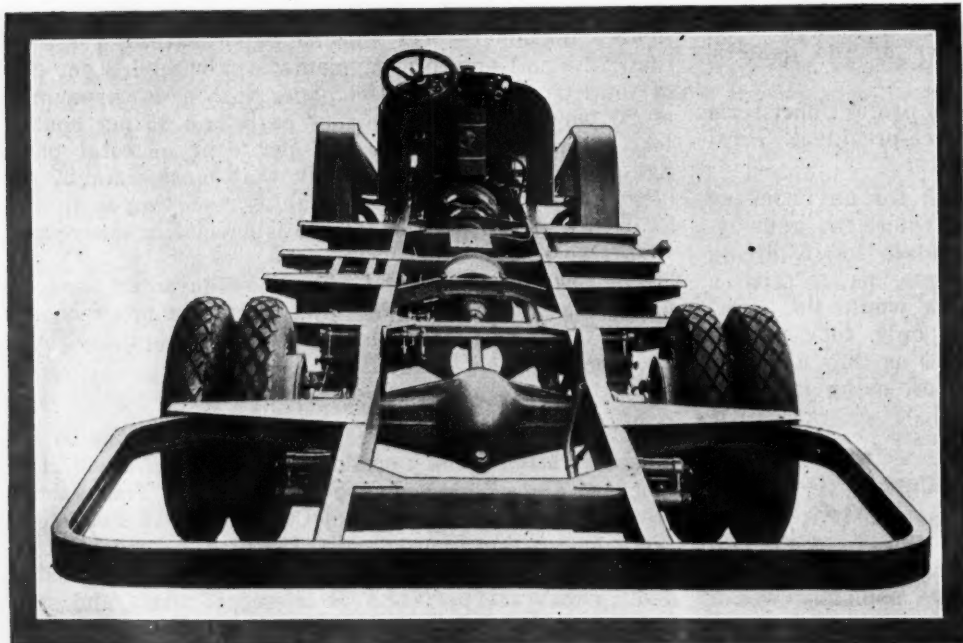
Except for the three exceptions already noted, the bus makers exhibited practically the same models shown previously at the Atlantic City exhibit of the American Electric Railway Association. These models were described in *Automotive Industries* of October 8.

By coincidence, each of the new models shown represented one of the three types of chassis which are in use in the bus field.

Except for the electrical drive equipment, the gas-electric chassis of Dorris is identical with the regular bus model introduced by the company two years ago. The new chassis is so designed that bodies may be switched from the older model to the electric drive chassis and by substituting a clutch, transmission, new propeller shaft, and changing the rear axle gear ratio, the latter chassis may be converted to the positive gearset type of drive.

General Electric Equipment

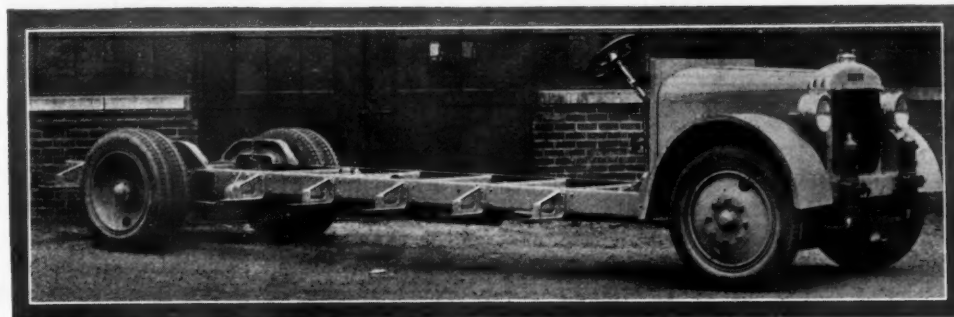
Generator, electric motor and controller fitted on the chassis are the latest developments of the General Electric Co., and embody many improvements over previous units of this type. A six cylinder valve-in-head engine of 4 by 5 in. bore and stroke—identical with the powerplant in the gearset chassis—furnishes the primary drive for the generator, the latter being bolted to the bell housing, forming a single unit. The motor is located directly in the



The new gas-electric chassis of Dorris Motors, Inc. Except for minor changes the engine and axles are identical with the units employed in the gearset chassis. Electrical equipment is the latest development of the General Electric Co.



New six-wheel bus introduced at the Detroit show by the Gotfredson Corp. One of the chief features is the high degree of flexibility in the rear axles. A six-cylinder Buda engine is used. Air brakes operate on four wheels.



Denby's heavy bus chassis designed for 30 passenger bodies. At the forward end of the front semi-elliptics, auxiliary air springs can be seen. The special body sill hangers should be noted.

center between the side frame members and is connected to the Wisconsin double reduction axle by a Spicer universal joint and a comparatively short propeller shaft. Hotchkiss form of drive is employed while the service brakes are of the internal expanding type on the rear wheels.

Seven Cross Members

The frame, which has a slight kick-up over the rear axle, has its side channel 9 in. deep and braced with seven cross members. Holes through the center of the cross members are provided where necessary to accommodate a positive drive from the engine if desired. Semi-elliptic springs are used all round, the steering is a Ross cam and lever gear while 36 by 6 in. tires, dual on the rear, are standard equipment. Chassis price is \$7,000.

Denby's chassis is laid out for bodies seating 25 to 30 passengers and its design follows conventional bus practices. The four major features of the chassis are the double service brake drums on the propeller shaft; engine, transmission and radiator mounted on a sub frame and removable by loosening four bolts; special body hangers allowing deeper body sills and auxiliary rear springs for severe overloads.

A six cylinder $3\frac{3}{4}$ by 5 in. engine is formed in unit with a multiple dry disk clutch and a four speed transmission. Four universal joints and three propeller shafts transmit the power to the rear axle, the latter being of internal gear type and designed for Hotchkiss drive. The emergency brake operates on the propeller shaft while the service brake is of the expanding type on the rear wheels. Four wheel brakes may be attached at slight extra cost. Air springs supplement the front semi-elliptics while auxiliary springs are fitted at the rear. Twelve malleable body hangers with their supporting surfaces below the bottom of the 7 in. channel members are riveted to the frame. This drop allows deeper body sills and correspondingly stronger bodies to be built without decreasing the head room. Steering mechanism is the Ross cam and lever type while the tires are 36 by 6 in. pneumatics all round with dual on the rear. Chassis complete weighs 7,000 lb. The wheelbase is 216 in. and the top of frame 21 in. above the ground.

In announcing its new six wheel bus chassis, which incorporates several new features, the Gotfredson Corp. frankly acknowledges its indebtedness to the previous manufacturers of buses of this type. Chief developments have been to improve the flexibility of the two rear axles and patents have been taken out covering the improvements embodied in the new chassis.

To allow free action over rough roads, both ends of each spring are swiveled to relieve them of any torsion due to uneven surfaces. On account of the extreme axle angularity permissible with this arrangement, specially designed universal joints and a splined shaft were developed. The axles are held together in such a way that either end of either axle can rise or fall and at the same time move farther away or come closer together as the springs operate. The design has been so worked out that there is no roll from the reactions of the braking or torque effects.

These features were provided for by connecting the two axles together with a torque tube which is free to slide in or out and also twist in either direction yet at the same time insure that the axles be in parallel planes under all conditions. Both rear axles are of the underslung worm type and together with the front axle are of Timken manufacture.

Air Brakes on Four Wheels

Westinghouse air brakes operate simultaneously on the two rear wheels of the driving unit and also on the front axle wheels. As both rear axles are geared together, when the foot brake is pressed retarding force is applied to all six wheels. The emergency lever is connected mechanically with the brakes on the rear axle and consequently the braking force is spread over four wheels when pressure is applied.

The model GL-6 Buda engine is an L-head six cylinder having a rated horsepower of 48.6 and a bore and stroke of $4\frac{1}{2}$ by 6 in. It is formed in unit with an improved type of clutch and a four speed transmission. Zenith carburetor, American Bosch magneto and North East generator and starter are regular equipment. Pneumatic tires are 36 by 8 in. all round while a Ross cam and lever type of steering gear is employed.

What's Going to Happen to Prices in Next Three Months?

Are further reductions likely? Signs indicate that low level already has been reached, but other factors may induce cuts.

By Norman G. Shidle

PASSENGER car prices may be in for another drop within the next three months, despite a multitude of signs that the low level already has been reached and that an upward movement is the next thing that might logically be expected.

The elements for and against further price reductions in the near future line up rather clearly. Against further reductions may be listed the following:

1. Rise in tire prices already recorded and further advance in crude rubber prices last week.
2. Rise in steel prices and expectations of further advances in sheet steel prices.
3. Recent advance in hardwood prices and in prices of some other commodities used extensively in automobile construction.
4. Maintenance of wages rates in the automotive field.
5. Used cars piling up in some parts of the country; lower new car prices would make used cars more unattractive buys than at present when difficulties are being experienced due to long instalment terms available on new car purchases and lack of similar financing accommodations on used cars.
6. Constantly improving design.
7. Constantly rising costs of merchandising.

As against these factors, the following may be set off as likely to influence towards further reductions:

1. Increase in plant capacity this year likely to result in strenuous efforts to keep production to as high a point as possible.
2. Production has been exceeding sales for several weeks and car stocks, while not yet unwieldy, have been increasing now for more than a month.
3. Despite constantly falling prices during 1925, the average wholesale price of cars—Ford excluded—in the third quarter of 1925 still was some \$20 higher than the average price of the same group in the first quarter of 1924.
4. Automobile concerns have made large profits this year and may feel that they can afford price reductions to keep up production and hold down overhead even though material prices and production conditions did not warrant further reductions.
5. Competition will be very keen by New York show time, due to the factors mentioned. Attempts to gain competitive advantages from price cuts may be made by a few manufacturers, thus forcing on competitors like reductions.

Arguing the pros and cons of automobile price reductions often is pretty much a repetition of the story of the

man who said he could give 18 reasons why he didn't like to go to the movies; one reason was that he was blind—the other 17 didn't matter. When production and dealer stock conditions get into such a relationship with sales demand as to bring about a period of very intense competition, a price cut usually is one of the first sales stimulants resorted to by some manufacturers. When competition reaches that point—the other 17 reasons don't matter for the time being.

One might be able to prove conclusively to the satisfaction of a good many people that further automobile price reductions at this time would be entirely unjustified in the face of basic economic conditions. He might be able to prove further that no worse time than the opening of the National Shows could be chosen for the conducting of anything in the nature of a price war. And he might be able to prove that almost every individual manufacturer, as well as the industry as a whole, would benefit more from having the show period pass by without prices gaining any predominant position in the show merchandising efforts than by permitting price cuts to get into the limelight at that time.

Proofs Not What They Seem

But only an economist of a most academic type would use those proofs as a basis for any positive statement that prices will remain in the background of the car merchandising scheme for the next three to six months.

Just about a year ago we reported the opinions of a number of leading automotive executives to the effect that "present conditions from both sales and manufacturing standpoints do not justify reductions in passenger car prices. We do not look for changes either up or down for some time."

Within two weeks after that one leading producer cut \$50 from prices on his lines and by the time another seven days had rolled around at least three other manufacturers had decreased their lists substantially. Others followed within the next month and the 1924 shows might have been the scene of a venomous price battle had not the largest producer of diversified lines held fast to a previously announced policy of not reducing prices at that time.

Sentiment in the industry today is much the same as it was last November. Most executives profess to see little if any justification for further reduction of passenger car prices. Some of them see quite definite reasons for higher prices.

Some reductions between now and January 1st or at the New York show seem almost certain at the present

time, but only a fortune-teller could predict for certain just what will happen generally.

The merchandising force of the 1922 National Shows was largely dissipated by the extreme over-emphasis which reductions focused on the price factor at that time. Last year, despite some changes around show time, the passenger car price structure as a whole held steady throughout the show period and throughout the spring sales season. As a result the 1925 price cuts came at a time when they really could do the most good as a sales stimulant. And as a result, partly of that and partly of other factors, sales were kept up this year long after the time at which a seasonal decline usually sets in.

Price changes, up or down, can be made a merchandising asset for the industry.

Airplane Propulsion by Reaction to Gaseous Stream

A MOST seductive problem is that of the propulsion of airplanes and other aircraft by the reaction to a jet of gases of combustion directed toward the rear. The principle involved is similar to that embodied in the propulsion of water craft by a jet of water instead of by a screw propeller. For instance, if a gaseous mixture is burned under compression and the products of combustion are allowed to escape to the atmosphere, there will evidently be a reaction which will tend to set the chamber in which the combustion takes place in motion. All of the heat of combustion is contained in the escaping gases, and the problem is to convert it into mechanical energy under conditions of maximum efficiency.

It is evident that if the gases were allowed to escape from the combustion chamber in a fine jet at a very high speed, the reaction would be insufficient to move the plane, and all of the energy would be wasted in creating eddies in the air. To improve the efficiency the gases of combustion must be mixed with air inside the apparatus, so that the speed of discharge is decreased but the volume of discharge increased.

Work of French Inventor

It is along this line that a French inventor, M. H. F. Melot, has been working. M. Melot first turned his attention to this problem shortly after the war, and descriptions of his earliest apparatus were published at the beginning of 1920. In this kerosene was burned in a combustion chamber lined with fire brick, and the gases issuing from the tuyere passed through a number of concentric injector-like nozzles. Each nozzle was of a size somewhat larger than the preceeding one, and air was drawn in through the spaces between adjacent nozzles. Thus the volume of air set in motion increased from nozzle to nozzle, and the volume discharged through the final, venturi-shaped passage was sufficient to create a high propulsive effect.

The details of the original device were somewhat crude, but five years of development work have eliminated many of the earlier defects. The following description of the new device is taken from *The Engineer* of London, which says that more complete details will be published after the conclusion of tests now under way by the Service Technique de l'Aeronautique.

The new device consists of a horizontal cylinder inside which there are two walls forming a chamber. In each wall is a spark plug for starting the engine with gas injected under pressure. There are three series of annular ports, the central orifices placing the carbureter in com-

munication with the chamber, and the end ports being in communication with an exhaust pipe converging to the first cone of the propulseur.

Inside the cylinder is a piston which moves freely from

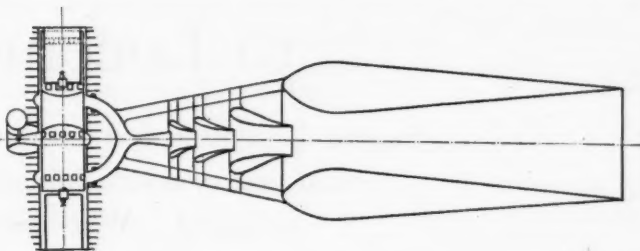


Diagram of Melot reaction propeller for airplanes

one end to the other. It has concave faces and sleeves with ports corresponding with those in the cylinder. The arrangement constitutes a simple type of two-cycle engine working with high compression. It is started by injecting under pressure the gas mixture, which is ignited by one of the spark plugs. The speed of the piston is sufficient to compress the gas to the point of self-ignition and the engine continues to run without the compressor and the spark plugs.

The piston sleeves are arranged to open the exhaust ports at such a point as to ensure the burnt gases entering the exhaust pipe at the highest velocity. The average pressure in the exhaust pipe is equal to the average pressure of the cycle. As, moreover, the explosion takes place under the most favorable conditions, with a compression to the point of self-ignition, it is claimed that the average pressure is higher than in an ordinary four-cycle engine.

The rest of the apparatus has undergone little change. The exhaust gases pass from a tuyere through a succession of four injectors, each being larger than the preceeding one and therefore drawing through a larger volume of air, which becomes considerable when the burnt gases and air pass finally through the large fourth injector. The reaction exerted by this mass of gas and air is declared to give to the apparatus a satisfactorily high efficiency. To provide for the diminishing density of the air at high altitudes it is proposed to employ a light compressor. Tests carried out with the apparatus are said to have shown that the total weight is less than 1 kilo. per horsepower. So far only laboratory tests have been carried out with the Melot Propulseur-Trompe.

A PPLIED Business Finance, by Edmond E. Lincoln, published by A. W. Shaw Co., discusses, in a practical manner, the problems of finance which arise from day to day in the business concern of average size in their relation to organization and to the purchase, production and consumption of goods. The present volume is a new and revised edition of the original book which first appeared in 1923 and had been changed so that the subject matter conforms to the best modern financial practice. Because it has been written from the standpoint of the average sized concern instead of discussing the financial problems of the great industrial organizations of the country it should prove valuable to a wider range of readers than is often true of books on this subject. Among the subjects discussed are: Business cycles, organizing and financing new companies, financial statements, use of commercial banks, trade and bank acceptances and other means of raising working capital, the financial aspects of purchasing, producing and selling goods, and the distribution of earnings.

"Model 90" Embodies Many Features New to Locomobile Practice

Engine is high speed type with L-head cylinders, detachable head and pressure lubrication. Four-wheel brakes are standard. Wheelbase 138 in., tread 58½ in.

By P. M. Heldt

THE announcement of a new Locomobile is an event, for while changes in its design have been made at frequent intervals, the "48" has been the one Locomobile model for a great many years.

On the same rating basis as that used for the "48" (the N.A.C.C. formula) the new model would be a "36" but, probably because the ratio of 36.48 would not give a correct idea of the power available in the new car, the old rating formula was discarded and that of the maximum engine output 90 hp., adopted instead, and the new design being known as Model 90.

The new model may probably be characterized best by saying that it embodies the same quality of materials and the same high class workmanship for which the "48" has been known since it was first placed on the market, and that it is designed in accordance with the latest engineering practice.

The engine is a high speed type with L-head cylinders, detachable head, light reciprocating parts, seven bearing crankshaft finished all over, silent chain front end drive, pressure lubrication and other up-to-date features.

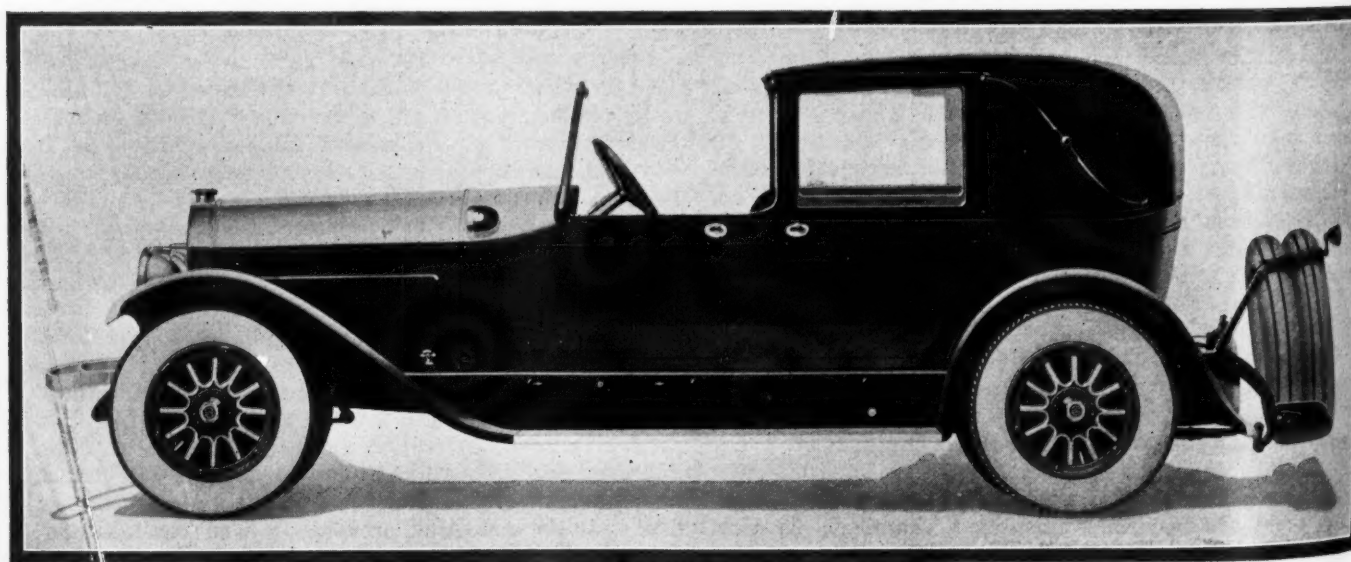
A single plate clutch is used, with molded asbestos lining, reliance for smooth engagement being placed on the spring action of the deformed disk. The transmission is a separate unit, with Maag-ground gears and with ball bearings throughout. Final drive and rear axle are of conventional design. Four-wheel brakes (Bendix-Perrot three-shoe) and balloon tires are, of course, standard

equipment, and, as in addition to the balloon tires, the car has rear springs 60 in. in length and shock absorbers all around, it leaves little to be desired from the standpoint of riding comfort. The wheelbase is 138 in. and the tread 58½ in., which figures, in conjunction with the engine output (90 hp.), will serve to give an idea of the size of the car.

It is expected that a large proportion of the cars of this model to be produced will be fitted with custom-built bodies, although a rather extensive line of stock bodies, both open and closed, is being offered. The prices of the chassis and of the different types of complete car are as follows:

Chassis	\$5000.00
Touring car	5500.00
Roadster	5900.00
Coupe	6950.00
5-Passenger sedan	7300.00
5-Passenger sedan with division	7450.00
7-Passenger enclosed drive limousine	7500.00
Brougham	7500.00
7-Passenger non-collapsible cabriolet	7500.00

The engine has a bore of 3⅞ and a stroke of 5¼ in., making the displacement of the six cylinders 371.5 cu. in. The compression space is 23.5 per cent of the combined displacement and compression volume, so that the compression ratio is substantially 4.25:1. Two large size openings are cast in the water jacket wall on the side oppo-



The Locomobile Model 90 Cabriolet which sells for \$7500. Seven other body styles are available on this chassis

site the valves. These are covered by sheet steel plates, and a water inlet manifold with four flanges is bolted to these cover plates. This promotes uniform circulation of the cooling water through the jackets, and as the inlets are located opposite the spaces between adjacent cylinders, there is a direct path for the incoming water to the valve chambers, where cooling is most needed.

The three inlet valves at each end of the block communicate with each other inside the casting, so there are only two inlet ports; on the other hand, there is a separate outlet from each exhaust valve, and the exhaust manifold has six flanges. A water outlet boss is formed on the cylinder head at the forward end, into which is set a bellows-type thermostat. The head is held down to the cylinder block by 23 bolts, a few of which are extended to support the tube through which the spark plug cables are carried along the head. Pry lugs are formed on both sides of the cylinder head to facilitate its removal from the block.

Valves Are Interchangeable

All valves are identical in dimensions and interchangeable. The clear diameter of the valve ports is 1 25/32 in. and the lift of the valves is a few thousandths over 3/8 in. The valve stems pass through removable bushings and at their lower ends carry the spring washers which have a long seat on the stem and are supported by split bushings entering a groove turned on the stems.

Cast iron pistons of a light design are used. These carry three rings near the upper end and an oil scraper ring near the bottom. Light ribs connect the head to the bosses and there are also circular ribs between the bosses. The skirt is partly separated from the ring belt by saw slots, and they are also slotted lengthwise, the slot running at a slight inclination and extending down only to the flange containing the groove for the oil-scraper ring. Relief is given the piston over the bosses by eccentric grinding.

The piston pins, which are tubular and case hardened, are secured in one of the piston bosses by a pin screw which extends entirely through the boss and piston pin. A bronze bushing is pressed into the upper end of the connecting rod and provides a bearing for the piston pin 1 1/8 in. in diameter by 1 3/4 in. long. At the bottom end of the connecting rods the babbitt is cast directly into the steel and no shims are used. Two standard type connecting rod bolts hold the cap in place.

The crankshaft is a seven-bearing design and is finished all over. All bearings are of 2 1/4 in. diameter. Crankpin bearings are 2 1/4 in. long while the seven main bearings are of the following lengths (front to rear), respectively: 2 1/8, 1 5/16, 1 5/16, 1 15/16, 1 5/16, 1 5/16, 3 1/16 in. As may be seen from the longitudinal section, end thrust is taken up on the front bearing. Diagonal oil holes are drilled through the crank arms through which the crankpin bearings are oiled from the main bearings.

Silent Chain Front-End Drive

At the forward end the crankshaft carries the driving sprocket for the Link-Belt silent chain "front end" drive, and beyond this there is mounted upon it the Lancaster vibration dampener, which is entirely enclosed within the timing chain housing and runs in oil. At its very end the crankshaft carries a grooved pulley for the fan drive. While the various parts at the forward end are driven by Woodruff keys, they are all held on by the starting crank ratchet which is developed in the form of a cap screw and screwed into a tapped hole in the end of the shaft.

The camshaft is drilled from end to end to serve as an oil lead for its own bearings, and is supported in four

bearings of the following dimensions (front to rear): 2 5/16 x 1 15/16 in. (long), 2 9/32 x 7/8 in., 2 1/4 x 7/8 and 2 7/32 x 1 1/8 in. The valves are operated by tappets of the mushroom type, the guides are held in place in holes in the top wall of the crankcase in pairs by means of yokes. The guide at the top extends slightly above a shoulder on the tappet, thus forming a pocket which catches oil and ensures effective lubrication.

Crankcase of Aluminum

The crankcase consists of two aluminum castings, the parting plane being about 2 1/2 in. below the crank axis. This, together with the fact that there are five bulkheads or partition walls and a wide flange around the bottom of the main casting, gives a very rigid supporting member. The main bearings are stiffened by two ribs on the bulkheads running straight up to the top flange or top wall and two more running to the bottom flange. With the exception of the rear one, which is of aluminum alloy, the bearing caps are of bronze.

Fuel is carried in a 21-gallon tank carried at the rear of the frame and supported centrally on its forward side from a channel section frame cross member and near its ends on its rear side from a tubular cross member of the frame. It thus has a three point support. A screw filler cap is provided which is secured by a central locking screw. The fuel tank has a 3-gal. reserve compartment and the reserve is made available by giving a half turn to a lever conveniently located on top of the tank. An interesting feature in connection with this device is that even if the operator should fail to turn the lever back to its original position when he refills his tank, the fuel supply to the carburetor will cease when only 3 gal. remains in the tank.

Fuel feed is by air pressure, a system which has proven very satisfactory on the "48." A small air pump mounted on the crankcase and operated by an eccentric on the camshaft pumps up a pressure of 2 lb. p. sq. in. in the fuel tank. For starting, the necessary pressure is pumped up in the tank by a small hand pump on the instrument board. A gasoline gage is mounted directly on the fuel tank, no dash gage having been found satisfactory with the pressure feed system.

A "United" air cleaner is fitted to the air inlet of the 1 1/2 in. Stromberg Model OX-3 carburetor. This carburetor has one special feature, which consists in automatically closing the air bleed of the starting nozzle by the operation of the choke, whereby the choke is made more effective.

Manifolds Separate Castings

The inlet and exhaust manifolds are separate castings but are bolted together. A jacket is formed on the inlet manifold where the vertical part joins the horizontal part, which jacket communicates freely with the exhaust manifold. Originally deflectors were provided in the latter to deflect the exhaust gases downward into the inlet manifold jacket, but these were found unnecessary and were eliminated.

With the exceptions of the battery, the whole of the electrical system is of DeJon make. The 5 1/2 in. generator (Model D D 4001) is driven from an enclosed accessories drive shaft on the left side of the engine through an Oldham type coupling, and the same shaft drives the water pump, which is located in front of the engine. The 5 in. starter (Model SB 4001) drives to a flywheel crown gear, engagement being by foot-shifted gears actuated by the same motion which closes the starter switch. The battery is a USL of 166 ampere-hours capacity. It is located in a battery compartment under the right splash apron,

and to make the filler plugs more accessible they are offset from the center toward the outer side. The ignition unit is driven through a vertical shaft at the middle of the length of the engine on the valve side, which shaft is driven from the camshaft through helical gears and drives the oil pump from its lower end.

Spark control is partly automatic. That is to say, in all ordinary driving the spark lever is set in a position marked "normal" on the quadrant and the necessary timing operations are effected automatically by a centrifugal governor embodied in the ignition unit. For high speed work the operator can advance the spark farther manually. All high tension cables are neatly enclosed in a metal tube running along the top of the cylinder block. Generator control is by the third brush system.

All wiring is carried in flexible metal conduit. The spark coil is mounted on the forward side of the dash and there are also two fuse blocks on the front of the dash. On the dash directly over the engine is mounted an engine light which facilitates inspection and adjustments under the hood at night. This same light can be taken out of its socket and screwed into a socket on a length of flexible cord on a reel and this can be made to serve as a general trouble light. Ordinarily this cord supplies current to a cigar lighter.

Lubrication is by the now conventional pressure system with a direct lead to each main bearing connected to the

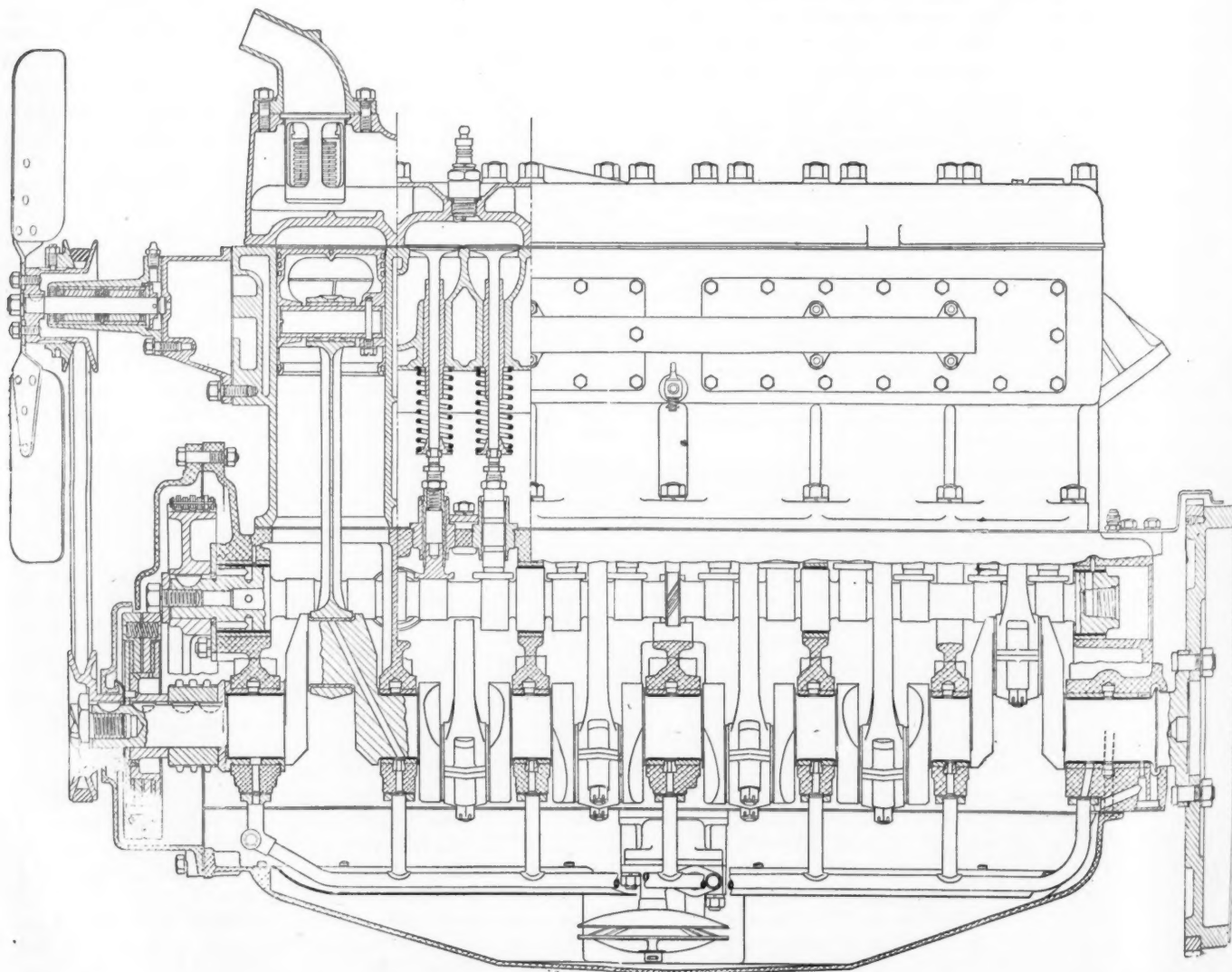
bearing cap. Oil enters the camshaft at one of its bearings and is fed through it to the other bearings. A direct-reading float type oil level gage is provided. The float being located in a pocket at the side of the oil sump. In this same pocket and concentric with the float and its stem is located a handy crankcase oil drain valve of the conical type which is operated by means of a handle at the side of the crankcase. The oil pump is bolted against the main crankcase casting and carries the usual oil strainer and relief valve.

Cellular Type Radiator

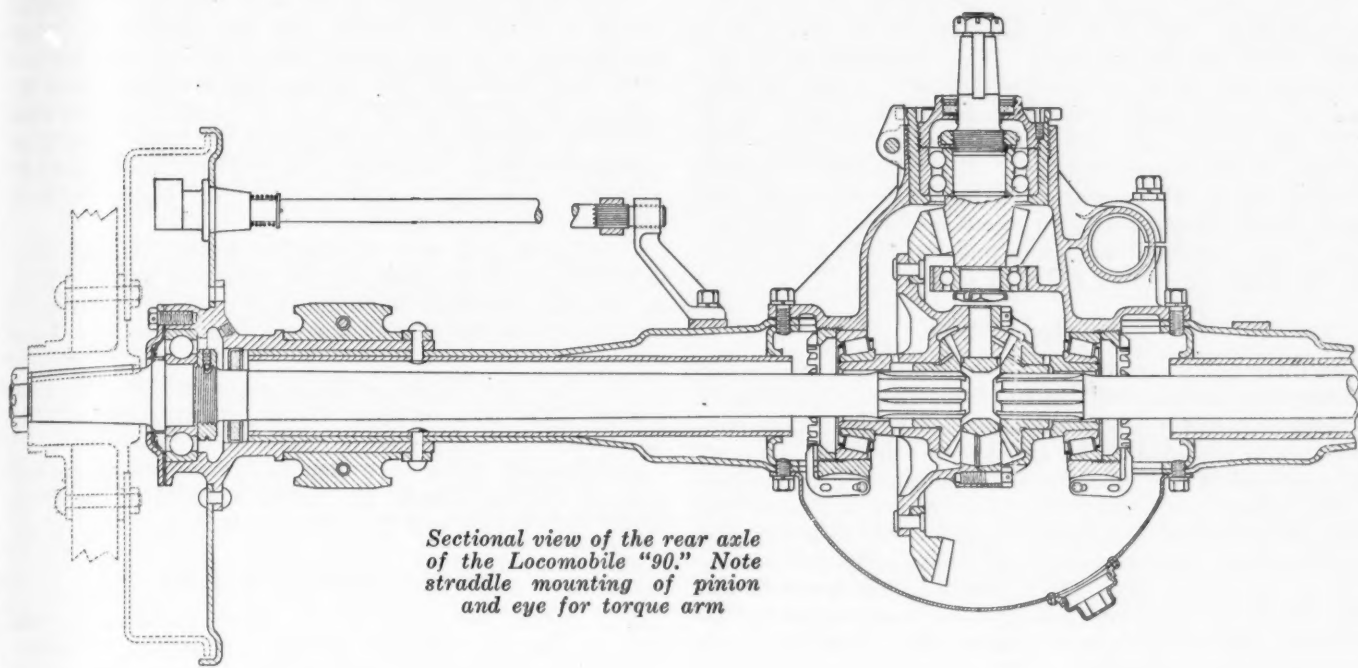
The radiator is of the cellular type, of G. & O. make, and has a detachable, pressed steel nickered shell. The centrifugal pump has a shaft of stainless steel. Back of the radiator is mounted the four blade 18-in. fan which is driven from the crankshaft through a V belt at $1\frac{1}{4}$ times crankshaft speed.

Owing to the fact that the transmission is a separate unit, there is no bell housing and the flywheel is exposed. The engine is supported from the main frame at four points.

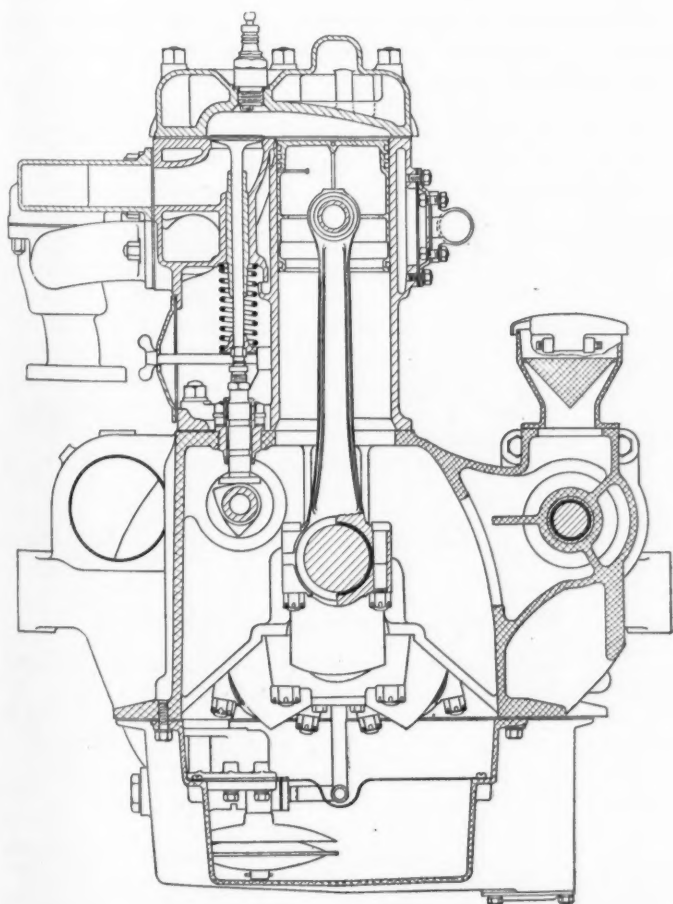
The clutch, as already pointed out, is of the single plate type. The driven plate, which is faced with molded asbestos, is divided into a number of sectors by radial slots and alternate sectors are bent in opposite directions. This gives a gradual engagement and makes smooth starting possible. The clutch shaft is piloted in the rear end of the



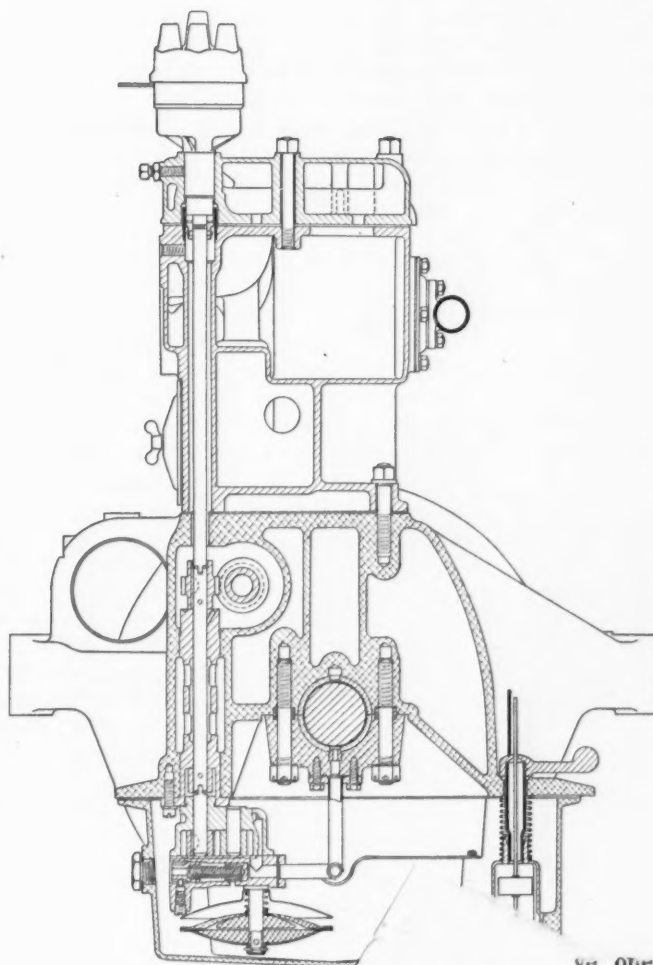
Longitudinal section of Locomobile "90" engine



Sectional view of the rear axle
of the Locomobile "90." Note
straddle mounting of pinion
and eye for torque arm



Cross section of new Locomobile engine



Cross section of engine
and chassis, showing particular
parts

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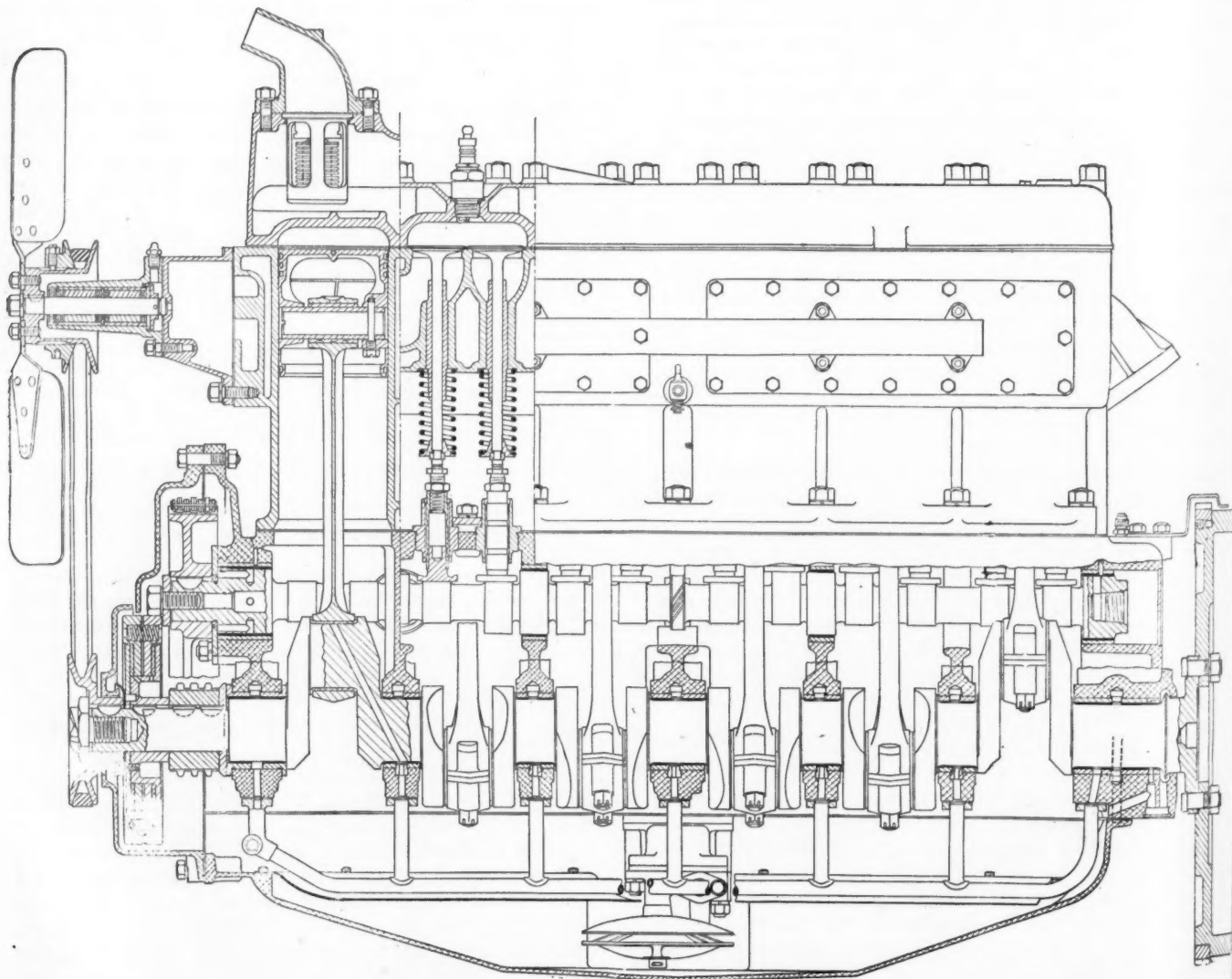
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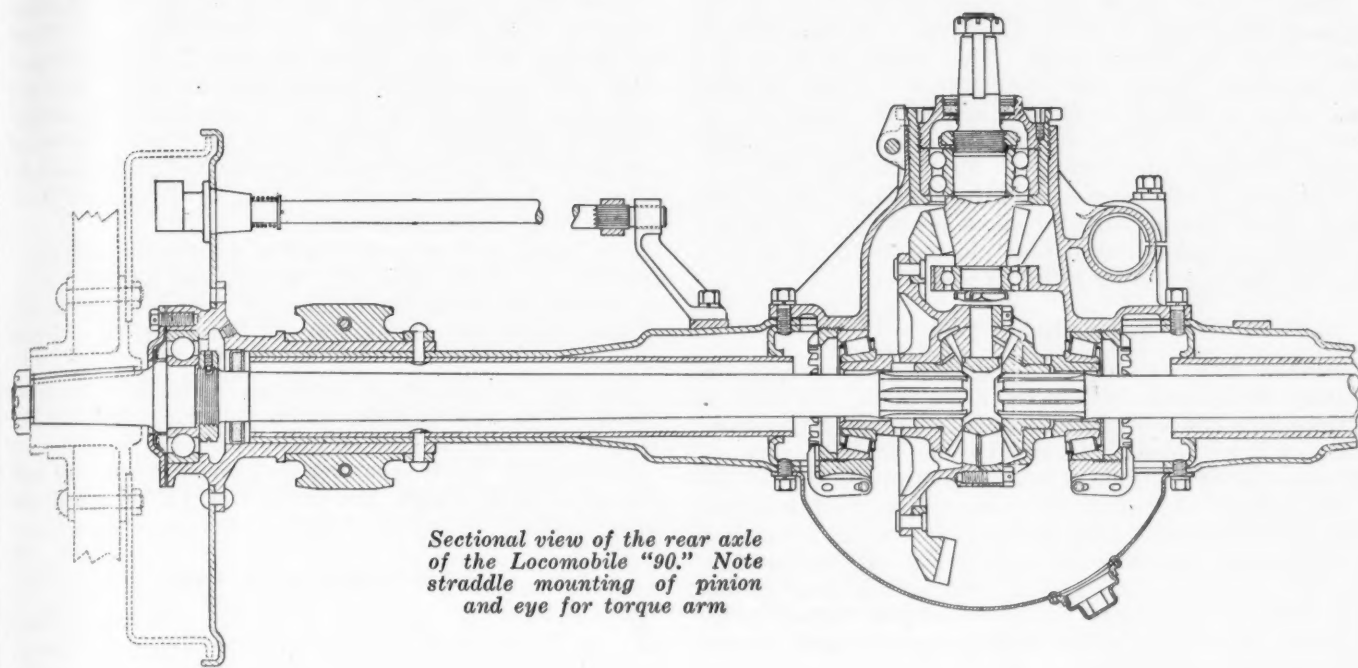
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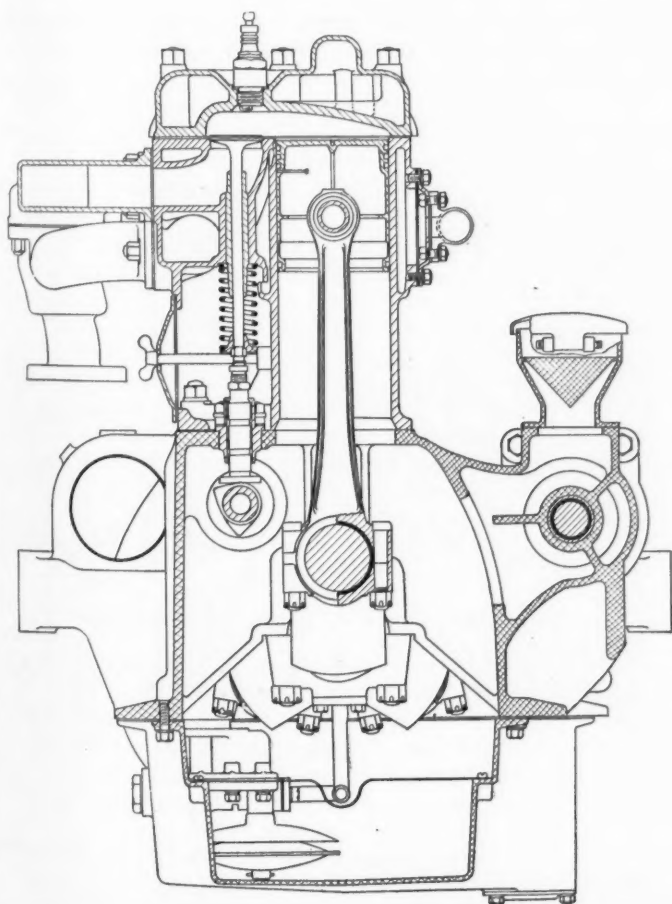
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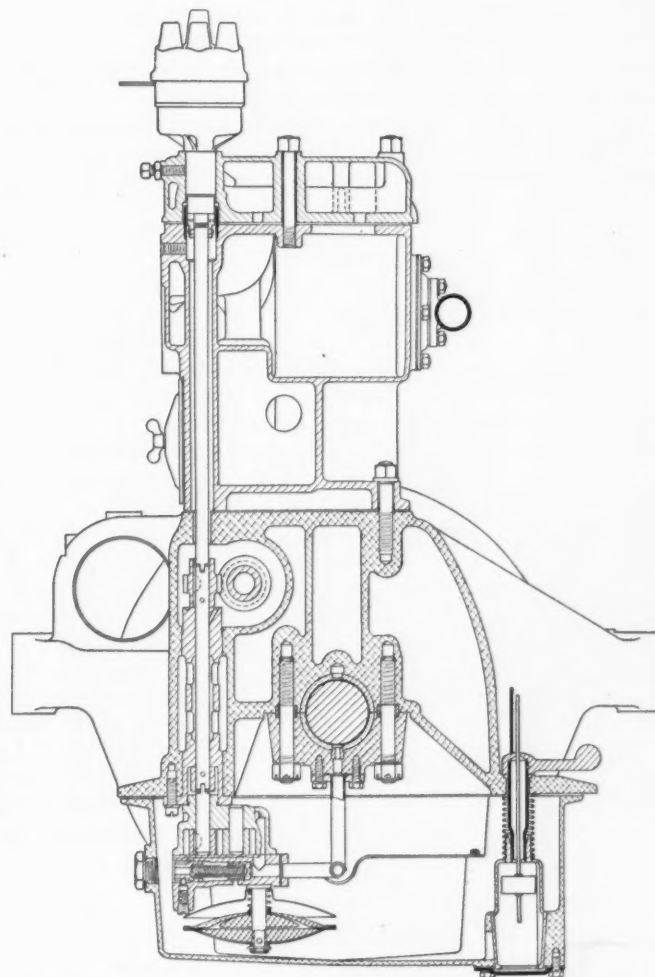
Longitudinal section of Locomobile "90" engine



Sectional view of the rear axle of the Locomobile "90." Note straddle mounting of pinion and eye for torque arm



Cross section of new Locomobile engine



Cross section of engine taken between cylinders, showing particularly the oil pump, oil gage and drain

crankshaft and connects to transmission drive shaft through a metal universal joint.

Three forward speeds and one reverse are given by the transmission, which is of the usual type with the countershaft below the splined shaft. This transmission is also of Locomobile design and manufacture. It has an iron case which is bolted to the rear side of the frame but is also supported at the rear by means of a bracket resting on top of another cross member. From the sectional view of the gear it will be seen that the shafts are short and rigid, which should make for silent operation. All gears are of alloy steel, oil hardened, and the teeth are ground by the Maag generating grinding system.

Transmission Lock

Annular ball bearings are used throughout except for piloting the splined shaft in the drive shaft. Shifting is effected by a ball mounted cane-type lever, and a transmission lock is provided. The speedometer drive is taken off the rear end of the splined shaft. At the left side of the transmission is a Kellogg tire pump which is started and stopped by means of a clutch lever located in a tool box under the left splash apron symmetrical with the battery box on the other side. The substantial character of the gear shift lever is worth noting. The gear ratios in the transmission are as follows: 3.32:1 (low), 1.82:1 (intermediate), 4.35:1 (reverse).

Nothing needs to be said about the propeller shaft, except that it is of tubular form and has a metal universal joint at each end. Three different final drive ratios are used. A 4.15 ratio (13 and 54 teeth) is used on the roadster; a 4.5:1 ratio (13 and 58 teeth) on all other models, while a 4.75:1 ratio (11 and 52 teeth) is offered as an option. Torque reaction of the rear axle is taken on a pressed steel torque arm whose end is supported between rubber cushions on a frame cross member.

The rear axle is of Eaton make and is of the semi-floating type with pressed steel, welded housing. Taper roller bearings are fitted on both sides of the differential, an-

nular ball bearings in all other places. The bevel pinion is straddle mounted.

Underslung mounting of the semi-elliptic rear springs serves to lower the frame and the whole car. These springs are 60 in. long and 2½ in. wide, and they are provided with self-adjusting spring shackles which were developed for the Model "48" a year or so ago and were illustrated in *Automotive Industries* at the time. The front springs are 40 in. long and 2 in. wide and also have self-adjusting cone-type shackles. Lovejoy hydraulic shock absorbers are fitted all around.

The frame is of very substantial design, the side channels being 5/32 in. stock, 7½ in. deep and having 1 15/16 in. flanges, and while the number of cross members is not unusual, those that are used are of heavy section and well gusseted.

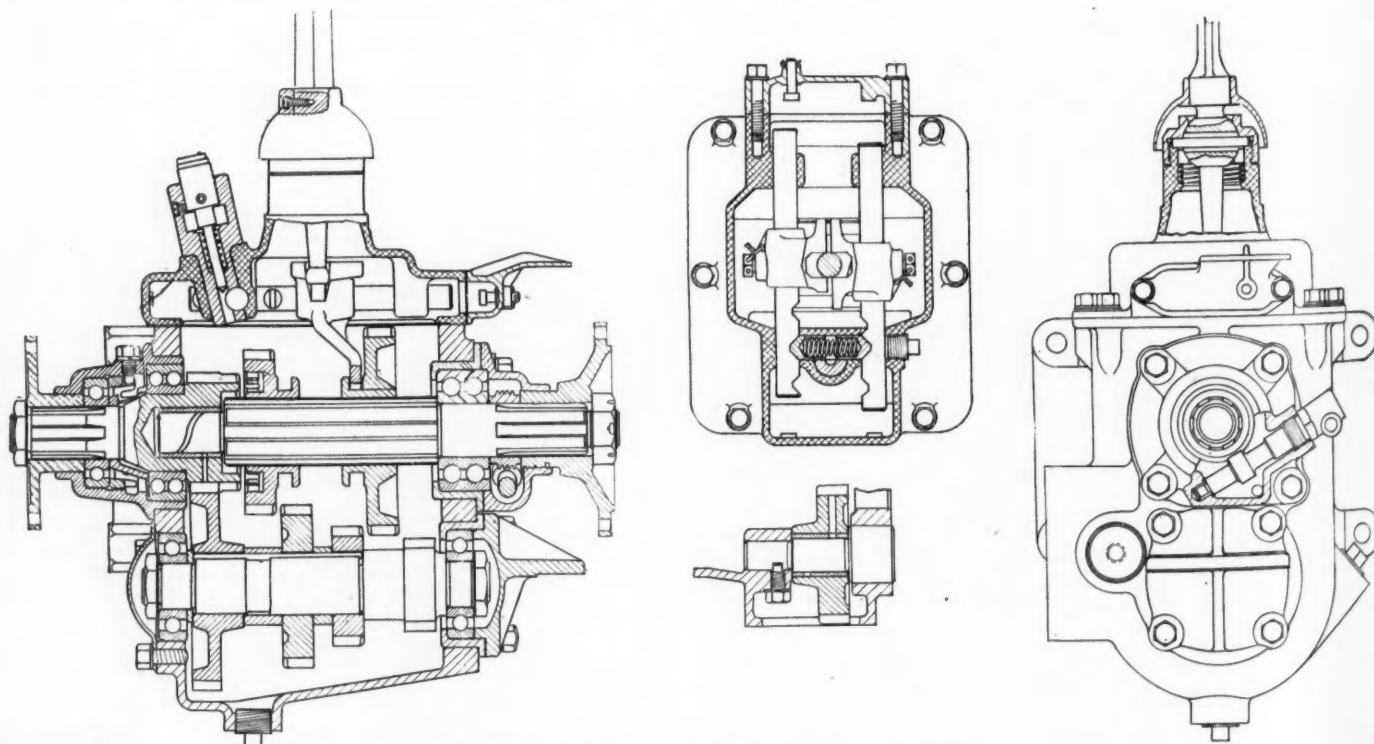
The front axle is also of Eaton make and is of the usual I-beam type with reverse Elliott steering heads. The front wheels are mounted on taper roller bearings.

Sixteen-inch three shoe Bendix-Perrot brakes are carried on all four wheels, the actual internal of the drums being 15 21/32 in. and the effective surface of each brake, 98 sq. in.

Brakes Equalized in Pairs

The brakes are equalized in pairs. While the brake pedal applies the brakes on all four wheels, the brake lever, which is located to the left of the driver's seat, applies only the rear brakes, through a special equalizing mechanism.

Steering is by a Locomobile Ross cam-and-trunnion type steering gear, operated by means of an all-wood wheel. Provisions are made whereby any looseness at the upper end of the steering column can be readily taken up. The controls, on top of the steering wheel, are of special Locomobile design, the levers being stronger than usual with the friction lock type, and ball-ended. All control connections are by self-adjusting block and spring connections. Adjustable stops for steering lock are provided on the front axle.



Vertical section and rear elevation of transmission, horizontal section through cover plate and detail of reverse idler

A combined dash and instrument board construction is used similar to that much seen on European chassis and which is very handy where custom-built bodies are to be fitted. A cast aluminum supporting bracket is fastened to each side frame, and through these brackets are secured the plate aluminum (3/16 in.) dash and the cast aluminum instrument base. Thus all instruments can be mounted and all connections made before the body is put on.

The balloon tires are of the 33 x 6.75 in. size and are fitted to Firestone collapsible rims on artillery wood wheels.

Instruments are neatly arranged on the cast aluminum, enameled instrument board. Beginning at the left there is first a little finger switch for changing over from the small bulbs in the headlamps to the cowl lamps, and vice versa. Next come the regular lighting and ignition switches. In the center is the so-called Waltham panel, which contains the Waltham speedometer clock, oil gage, gas pressure gage and an ammeter. On the right side of this is the hand pump for pumping up pressure in the fuel tank when first starting up, and finally comes the electric cigar lighter with extension cord for the trouble lamp, as already explained. There are two electric lamps on the instrument board, with reflectors on top, so the board is quite uniformly lighted.

All of the major tools in the tool box under the left splash guard are held by clamps or straps, so that each one is always in its proper position and can be reached instantly.

A line of two open and six closed body types is being offered. The open models have hand-buffed leather upholstery and Pantasote tops, while the closed models are all trimmed in broadcloth.

All bodies are of composite construction, with ash frames and sheet aluminum paneling. All doors are of the flush type, in both the open and closed types. All bodies were designed at the Locomobile plant, the development work having been done by Sidney Atteby who was associated with Mr. Daniels, general manager of the Locomobile Co. of America, at Reading, Pa., years ago.

One feature of the closed models is the windshield, which is divided along the vertical center line so as to make virtually two individual shields. Very light frames of bronze are used for the glasses, so as to detract as little as possible from the field of vision. These frames are countersunk or tongued and grooved on the edges to give a rain-proof effect.

On the closed models, instead of having a conventional visor in front of the windshield, a movable visor is provided back of the shield. This rolls up like a curtain when it is not needed, and a patent has been applied for on it.

All interior body hardware is of Locomobile design. One neat feature is a vanity case inserted in the arm rest. This has a mahogany cover inlaid with silver. The two extra seats in seven-passenger cars have spring cushions and arm rests and are quite comfortable.

Ford Issues Service Book

AS an aid to establishing complete standardization of methods employed in repair service, the Ford Motor Co. has completed a text entitled "Ford Service," which is for distribution to Ford dealers and service stations. The book, which includes about 300 pages and 540 illustrations, is the result of several years' research by Ford engineers. It covers in minute detail every operation in assembling and repairing Ford cars.

"Ford Service," which is intended primarily for the mechanic but can easily be assimilated by the layman, deals with the technical and mechanical side of Ford car

repairs and also treats in detail other phases of the dealer's business; managing the repair shop, installation and maintenance of equipment and contact with customers. The book is divided into three sections. In the first are outlined factors that contribute most to a successful organization. This section also gives a list of the equipment essential to the operation of a successful repair shop, and discusses the methods of managing a parts department, explaining the various steps taken by the dealer in the service-follow-up system. The second and third sections of the book explain the authorized Ford way of disassembling, assembling and repairing Ford cars. Over 200 pages and many illustrations have been used in these sections. A time study table is given at the end of each chapter and gives the time normally required for each step in the operation.

A Directory of Specifications

THE Directory of Specifications published lately by the Department of Commerce contains an alphabetical list of all commodities which are purchased by Federal, State or municipal agencies and a thoroughly classified list of the various specifications for these commodities formulated not only by the public purchasing agencies but by many other organizations. A 65 page index at the back of the volume makes the task of locating any particular item of information very easy.

This book is the result of a project started in 1923 by the Department of Commerce with the cooperation of governmental purchasing agencies and of 14 national organizations which are interested in the subject of specifications. Over 500 of the former and about the same number of the latter have been interrogated with the result that the present compilation includes a very complete list of all specifications which are of value. In every case the organization that formulated the specifications is given with a brief title as applied by the formulating body and in the rear of the book the addresses of all these organizations are given so that those who wish copies of complete specifications may obtain them easily.

In this connection, the second step in the Department's plan is to publish shortly an Encyclopedia of Specifications which will contain the actual specifications or abstracts instead of titles only.

To all persons or organizations who make purchases of any size this book will be valuable and the benefit to the country as a whole of its extended use, through unification to demand and the resulting standardization of products, should be great.

AN investigation of the effect of various impurities on the resistivity of copper has been made by Prof. A. L. Norbury of University College, Swansea, who reported his results in a paper presented to the Institute of Metals. The increase in the specific resistivity of copper due to the presence of 1.0 atomic per cent added element is for each element as follows: Aluminum, 1.1; silicon, 3.8; manganese, 3.1; nickel, 1.2; zinc, 0.27; silver, 0.14; tin, 2.4. For 1 per cent by weight of each added element the following increases in the specific resistivity were found: Aluminum, 2.6; silicon, 8.6; manganese, 3.6; nickel, 1.3; zinc, 0.26; silver, 0.09; tin, 1.3.

ON page 863, *Automotive Industries* for November 19, 1925, the statement is made that the six wheel buses operated by the Detroit Motorbus Co. have one square inch of service brake area per pound of vehicle. This, of course, is a typographical error—the ratio given by Mr. Evans was one square inch to 17 lb. of vehicle.

Means Suggested for Overcoming Pitfalls in Measuring of Gear Teeth

Circular pitch, tooth thickness and space width are calculated as lengths of arcs, but are measured as lengths of chords. Rules for inspection and methods of checking tooth elements are given.

By J. L. Williamson *

Research Engineer, Fellows Gear Shaper Co.

THE relation between the circular pitch, the tooth thickness, and the space width of gear teeth is so definite that it would seem impossible to find a discrepancy between these measurements and yet very often they do not agree. When we refer to these dimensions we usually mean the chords subtended by the arcs instead of the arcs themselves. These are shown in Fig. 1.

It can be seen that a definite trigonometric relation does exist and that if we were to make actual measurements no discrepancy should be found. As a concrete example, let us consider a 15-tooth 3-pitch gear. Assuming the space to be .004 in. too wide, the circular pitch chord should be .00394 in. too long. The difference is only a little over .00006 in., and, because most testing machines will not indicate so slight an error, we should probably say that the .004 in. found in the space width was also found in the circular pitch.

Usually, however, we do not make actual measurements but check the variations in tooth thickness, space width, and circular pitch by taking relative readings. We set our fixture for checking the thickness of teeth *near* the pitch line. Another setting is required for the space width which is also taken at a point *near* the pitch line. Then still another setting is required for a comparison of the circular pitches on one side of the teeth, and a slight change-over of the machine for checking the other side. These readings are also taken *in the vicinity of the pitch line*. When we have finished, perhaps we have measured the lines indicated in Fig. 2.

*Paper presented at the semi-annual meeting of the American Gear Manufacturers Association at West Baden, Ind.

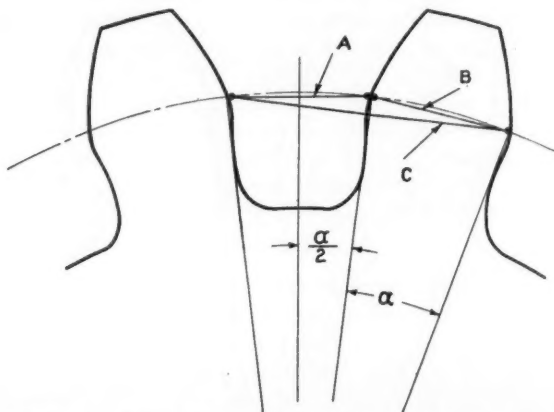


Fig. 1. Arcs and chords of gear tooth elements

It is apparent that effort spent trying to compare these readings would only be wasted, and yet the values for each dimension taken separately tell us much about the physical characteristics of the gear. Let us consider some of the factors which have entered into our measurements and find the reason for the conditions indicated.

The thickness of a tooth is frequently measured from the top by use of a templet or a tooth caliper. It can readily be seen that the outside diameter, its concentricity with respect to the bore, the number of teeth, and the pitch all effect this measurement and make it necessary to introduce certain correction factors. Sometimes these factors are very simple and can be safely used, but more often they result from such a complex relation that perfect correction is almost impossible.

Another Method of Checking

Another method of checking tooth thickness or space width makes use of a micrometer fitted with V-blocks to represent rack teeth or spaces. These attachments are made to the correct pressure angle and of such thickness that a normal reading gives the diameter of the pitch circle. This method also has certain disadvantages, because a wide space opposite a narrow space could show the correct over-all dimension and not indicate the errors. In addition to this, if the involutes were not correct, the measurement would not equal the pitch diameter, notwithstanding the fact that the spacing might be perfect.

The practice of measuring these dimensions at a constant distance from the center of the hole eliminates many of these objections. By referring to the accompanying illustration, Fig. 3, it will be noted that the gear to be tested is mounted on stud A which is attached to handle B. These move about center C until the handle contacts with stop D and the tooth to be measured is between points E and F. E is in a fixed position and F is free to move about center G.

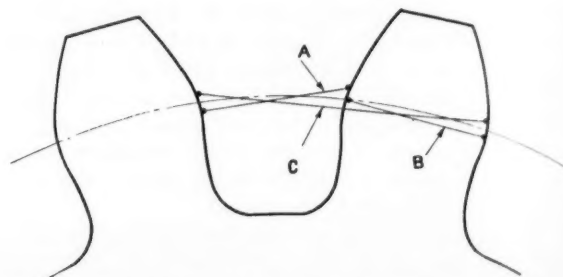


Fig. 2. Dimensions that may be measured by error

While this may not be absolute with only one of the points free to move, the correction is so slight that it can be safely neglected. The same fixture can be used to check the width of space by simply bringing *E* and *F* closer together so that they will enter a space with *E* contacting on one side and *F* on the other. The necessary adjustment should be made at *D* to allow *E* and *F* to touch the teeth at the pitch line if these variations are to be compared with the circular pitch test.

Circular Pitch Important

The circular pitch is one of the most important dimensions to check. Sometimes an exact measurement is made on the pitch circle, but usually little attention is paid to this, and comparative readings are taken on any circle. This in itself would not be serious were it not for the fact that very often one of the points is on one circle and the other point is on a different circle. These are shown in Fig. 4. This gives a condition which is seriously affected by the profiles. We may get a relative spacing test, but the errors indicated may not be spacing errors. They may be variations in the involute. Perhaps this could be detected by checking at various points on the tooth; one near the top and one near the bottom. If, however, the variations in circular pitch are to be compared with tooth thickness and space width readings, all measurements should be made on the same circle.

Eccentricity of a gear is often checked by placing a ball or master rack tooth in each space and noting changes in the distance from the center of the bore to the points of contact. Obviously this is affected by errors in spacing and profiles which are usually indicated by abrupt changes, whereas eccentricity alone causes a regular movement of the needle from zero to the highest reading and back to zero. Doubtless, the thing that should receive the greatest attention if a ball is used is its diameter. If the ball is so small that it contacts too near the bottom of the space the movements of the indicator are very easily misinterpreted. By referring to Fig. 5 it will be seen that a slight spacing error will allow the ball to enter the space to a considerable depth and the eccentricity of the gear will have very little effect on the indicator. Carried to the extreme, if the teeth had parallel flanks and the diameter of the ball were the same as the width of the flank, the slightest addition to this width would allow the ball to drop to the bottom of the space, notwithstanding the fact that it might be on the high side of the gear. These are shown at *C* and *D*.

In order that the eccentricity may have a greater effect on the indicator than errors in spacing, we should use the largest possible ball without danger of contacting on the corners or at points where the involutes have been relieved. Conditions at *E* and *F* should be compared with *A* and *B*, which shows a ball in contact near the pitch line. It will

be seen that the ball has dropped approximately two times as far at *B* for the same error in spacing.

The same general condition is present if a master rack tooth is used. The illustrations in Fig. 6 show the effect of spacing errors on rack teeth of various pressure angles. The condition at *C* and *D* is very different from that shown in the previous illustration. The increase in space width has allowed the rack tooth to enter a little farther than at *B*, but it does not touch the bottom of the space.

Fig. 7 shows a condition that is not always appreciated. The point of contact on the tooth surface changes with every variation in spacing if the ball is used, but it does not change as the rack tooth moves in or out from the center of the bore. The line of action always passes through the center of the ball and is tangent to the base circle. As the ball changes its position with respect to the center of the gear the angle of the line of action must also change. In the case of a rack tooth the line of action is always perpendicular to the side of the tooth and since the side is straight, the angle of the line of action is constant.

Conclusions to Be Drawn

The following conclusions can be drawn from the foregoing:

To check eccentricity the points of contact should be as near as possible to the ends of the teeth.

To check spacing the points of contact should be near the pitch circle.

Comparative readings cannot be obtained on different testing fixtures unless the diameter of ball is the same on both machines.

Comparative readings cannot be obtained on different testing fixtures unless the pressure angle of the rack tooth is the same on both machines.

Sometimes a gear is tested for eccentricity by engaging it with its mating member without backlash and noting changes in the center distance as the teeth pass through mesh. It is conceivable that the eccentricity of one might offset the eccentricity of the other. Often the second gear is master of known proportions. While this is preferable, all changes in center distance are not entirely due to eccentricity, as the other teeth in the arc of action influence the movement of the free stud. These methods are likewise affected by errors in spacing and profiles.

The normal involute pitch is the length of the arc off the base circle between corresponding sides of adjacent teeth. If the involutes are correct, the distance between the profiles is the same on any straight line which inter-

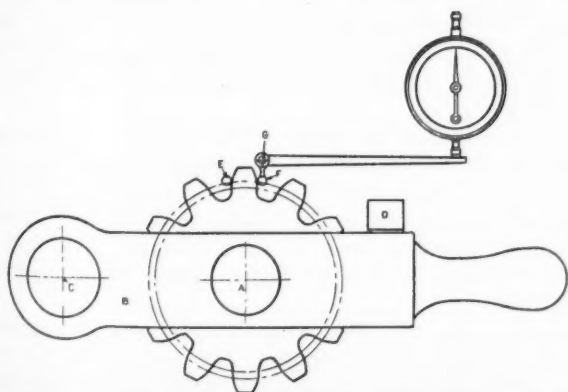


Fig. 3. Device for comparing tooth thicknesses

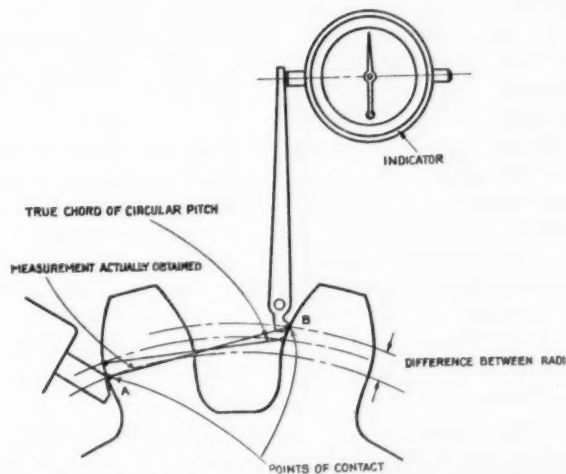


Fig. 4. Showing possible source of error in testing for circular pitch

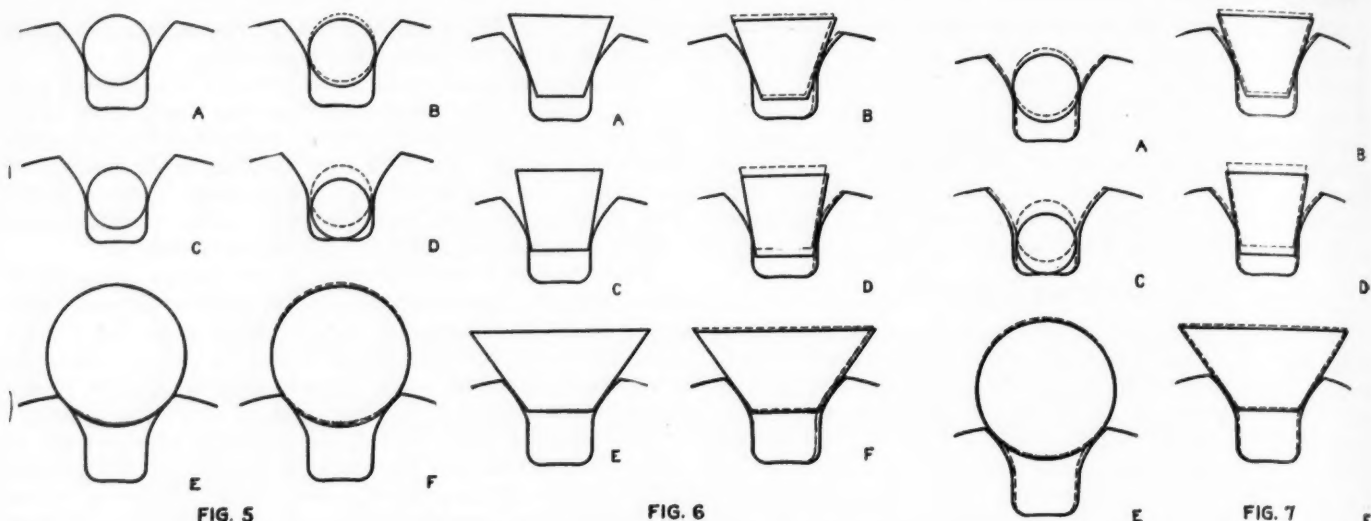


Fig. 5. Use of balls in checking for eccentricity. Fig. 6. Use of rack tooth for checking eccentrics by showing effect of spacing errors. Fig. 7. Showing advantage of rack tooth over ball in making pitch line measurements

sects both curves and is tangent to the base circle. If this dimension is used to compare the spacing or profiles the measurements should be taken at several points along the tooth surface.

There are involute testing machines, the designs of which are based upon the geometric properties of the curve. With these machines it is possible to take very accurate readings of the profiles of an involute gear tooth from the base circle to the top, if the machines are sufficiently sensitive. The curve is not affected by errors in tooth thickness or spacing, for the reason that an involute can be generated through any point on the base circle. Because of this fact, we should have more confidence in this reading than any of the others.

The few cases cited above are sufficient to suggest the need for highly trained inspectors. Some of the essential qualifications are:

1. Thoroughness: It is not sufficient that he be highly skilled in the use of inspection equipment. He should also have a desire to understand the theories which form the basis of his practice.

2. A receptive mind: Many valuable suggestions are received from unexpected sources. Ideas should be carefully considered before they are condemned.

3. An analytical mind: No new method should be adopted before its value is proved.

4. Creative ability: He should be able to develop new methods and improve old ones.

5. Keen appreciation: Errors are possible with the best of measuring fixtures. This condition will continue just as long as the human element is involved.

6. A cooperative spirit: It is his duty to see that the plans and specifications of the engineering department are followed in the process of manufacture.

7. An exacting nature: Limits which have been established by the engineering department must not be exceeded.

8. A tactful sense: Inability to obtain correction of work without antagonizing foremen retards production and destroys morale.

This list might be increased to the point where the superman would be portrayed, but he is not necessary. Inspectors in general usually possess most of the qualifications mentioned and those which are not prominent

can easily be developed if careful attention is given to this by the proper parties.

It might follow that a well planned system of training for inspectors is the logical solution and there are many arguments that could be presented in favor of it. As long as the human element plays such a prominent part, we should first raise the standard of our inspectors if we would raise the standard of our inspection.

However, we must not make the mistake of believing that the inspector can be of the greatest value to any concern through his efforts alone. He must have the confidence and assistance of the management. Direct lines of responsibility must be established and maintained. Since the inspector's work is to see that the engineers' directions are carried out, it naturally follows that the Chief Inspector should be directly responsible to the engineers. He should obtain their decision on questions concerning the quality of the product or the application of general limits to special classes of work.

This, of course, applies to any line of inspection, but the degree to which it should be carried depends upon the class of material which is being produced. Gear cutting methods have been developed to the point where precision work can be obtained on a quantity basis. We no longer think of them simply as a means of transmitting power and motion. While these are still their chief functions, the nature of the application presents many interesting problems. For this reason our manufacturing limits should be based upon actual operating conditions. We should study the combined effect of the errors. This should not be confused with the investigations which are being conducted to determine the effect of tooth shapes and errors on strength, durability, quietness, etc. It is an entirely different problem. It deals with errors which occur in combination, such as spacing and tooth forms; spacing, tooth form and eccentricity; eccentricity and spacing, etc.

This can hardly be determined from a tabulation of variations in tooth parts. The relation that one bears to the other is too complex to be easily understood. More and more we are coming to realize that the day of single dimension measurements is fast passing and that our rejection limits should be based upon actual operating conditions.

It is not infrequent that gears which have passed inspection are found unsatisfactory for service while gears which will not pass inspection give no trouble when assembled.

Just Among Ourselves

Polar Expedition Equipment Not Needed to View 1926 Show

"The mercury began slipping down thermometer tubes around noon and it kept right on slipping. Subway trains are not notoriously warm and breezes sift through the doors and windows of taxicabs. Getting far up into the Bronx was something of an adventure, therefore, on that wintry afternoon and evening." Guess what that's quoted from! We'll tell, to save you the trouble. It's from the story of the 1924 New York Automobile Show published in *Automotive Industries*, January 10, 1924. And getting to the Show that year was an adventure—snow, rain, blizzards and hurricanes—that day will be in the Almanacs for a long while. We get a big kick out of *looking back* on it. It was a great Show and worth the trip to be sure, just as was the Jubilee Show last year, but we can't help being pretty darned glad that the big event has moved back to Grand Central Palace again. Weather won't make any difference. One can bum around the show, meet a lot of people, and see a lot of things without looking forward to a long, unpleasant journey back to the hotel. The very fact that the Show is so convenient to the hotels is going to mean more people at the Show and less hanging around the hotel rooms than ever before. That's our guess anyhow. See how it comes out.

Merchandising Needed in All Parts Selling

THE factory service man is the recipient of a lot of hard knocks, many of which probably aren't deserved. We heard one comment the other day, however, which we think well enough of to pass on. "Doesn't the factory service man usually give far too little attention to the merchandising

phase of the service problem?" asked a man who has spent much time studying the situation. "The independent parts maker," his argument continues, "does everything he can think of to merchandise his product; he doesn't just concentrate on price and mechanical considerations. He dresses up his stuff in packages, he gives dealers ideas about selling, he does a hundred and one things to make his product more easily disposed of and more attractive to sell. This phase of the parts matter doesn't get anything like major attention from factory service managers in a majority of cases. The car manufacturer won't get satisfactory parts distribution until he accepts the proposition that he will get just that part of the business which is coming to him on a competitive basis." That sounds to us like a common-sense way of looking at the problem. There are few natural monopolies or God-given rights in American business.

S.A.E. Scores With Transportation Meeting

THE question of whether the Society of Automotive Engineers should or should not hold a Transportation Meeting probably won't come up again seriously for some time. The session staged in Philadelphia two weeks ago proved conclusively that there is a very real interest in such a meeting and that the S.A.E. can provide very successfully the sort of gathering desired. A few less papers and a little more discussion would have pleased some of those present, but the meeting as a whole was so entirely adequate that any detailed criticisms are likely to seem a bit out of place. Not only was the attendance surprisingly large, but an unusually high proportion of those who talked

had something of practical value to propound to the assembled transportationites.

Volume-Price-Profits—an Important Automotive Trinity

VOLUME-Profits-Price—there is the trinity which has to be obtained over a period of years. And each one of the three has to be considered in its relation to the other two if the results of the consideration are to be accurate. On a good many occasions prices have been set chiefly on the basis of what somebody else has done and not in accordance with any serious study of the relation between price and volume and profits. But some very careful studies of this kind have been made in the industry and more are scheduled for the future. One investigation made recently revealed the interesting fact that on the car in question in all probability increased price and decreased volume would result in greater profits by a considerable margin than would decreased price and increased volume. Were the price to be increased beyond a certain point, of course, volume would decline sufficiently to bring decreased profits, but in the case studied, any price decline would have meant a profit decline. Further studies of this kind should be very helpful in stabilizing both volume and production in the industry.

News Defined in Same Way for 1,000,000th Time

A MOTOR truck knocked one of Mr. Ford's D. T. & I. railroad engines off the track the other day. The road is suing the truck driver for \$403. We record this fact in line with our regular policy of printing whatever seems to be news. Of course, if the man had bitten the sandwich that wouldn't rate space in these columns, but when the sandwich bites the man . . . *n'est ce pas?*—N.G.S.

Nickel and Chromium Improve Iron Castings

Tests show increased strength, hardness and toughness, finer graining and equalization of conditions throughout castings.

THE addition of suitable amounts of nickel-chromium combinations to gray iron increase its strength from 10 to 50 per cent; increase Brinell hardness from 20 to 50 points without impairing machinability; reduce edge, surface and corner chilling on thin sections or eliminate hard spots; increase toughness and deflection, particularly on thin sections; refine the grain and produce denser less open castings, and equalize hardness, strength and machinability over large sections or between small irregular sections.

These findings are the results of extensive tests made by the International Nickel Co. and reported by T. H. Wicken-den and J. S. Vanick in a paper read before the American Foundrymen's Association.

Automotive manufacturers have been experimenting for some time in an effort to improve gray iron castings such as are used for pistons and piston rings, cylinder blocks and many other parts of an automobile. Both nickel and chromium have been found to be advantageous when used as alloying elements but considerable uncertainty has been felt, in the absence of authoritative data, as to just what should be expected of such alloyed castings.

Summary of Results

The tests described have been carried out with great care and the results may be taken as convincing proof of the value of nickel and chromium additions to iron castings. A summary of the results of the tests, abstracted from the paper, follows:

Effect on carbon and graphite: Below 4 per cent nickel practically does not affect total carbon, at 5 per cent it begins to decrease it slightly. Nickel accelerates graphite formation and carbide decomposition and so exercises a marked influence in reducing combined carbon to about 0.8 per cent. This effect is roughly proportional to the amount of nickel added and is most prominent when the nickel content is 1 per cent or over.

Effect on chill: Nickel is very effective in reducing chill and preventing the formation of white or mottled iron or hard spots, particularly in thin sections, at edges, corners, etc. This effect is quite positive with 1 per cent nickel or more and is generally found with smaller amounts down to about 0.25 per cent. Chromium additions tend to increase chill and combined carbon, white and mottled iron, hard and brittle at edges and corners.

Effect on fracture: Apart from their effect on chill, nickel and chromium either alone or in combination serve to refine the grain of gray iron. This effect is obtained with amounts as small as 0.15 to 3 per cent. With additions of nickel of 5 to 10 per cent the grain is again coarsened.

Effect on structure: Nickel encourages the formation of a cellular pattern within which graphite, ferrite and pearlite or sorbite are finely divided. Chromium assists in the development if the silicon content is high. Excessive chromium—over 0.5 per cent—produces a second and coarser network of residual cementite superposed on the first. This network promotes brittleness and may develop machining

difficulties or accelerate wear. Nickel and chromium in ratios of from 3 to 1 in low silicon iron to 3 to 2 in high silicon iron improve the structure as well as add to desirable properties such as toughness, solid solution hardness, strength, uniform machinability, and wearing qualities.

Effect on hardness: Chromium additions increase hardness. Decrease of silicon or total carbon content or increase of sulphur content accomplishes the same purpose. Nickel additions from 0.25 to 5 per cent increase hardness from 10 to 100 points Brinell. This hardness, however, is not obtained at the expense of machinability because the metal is not chilled nor its combined carbon increased but that portion of the iron already combined with carbon is rendered uniformly harder sorbite. The hardening effect of nickel is dependent upon the amounts of combined carbon present and most favorable results are obtained when this amount is not below 0.50 per cent.

Effect on machinability: The machinability of gray iron depends primarily on its freedom from excess carbide, chilled or hard spots. Since nickel acts to eliminate these areas it improves machinability. One per cent and often less of nickel is effective, depending upon the section, the silicon and carbon content, and the amount of chromium present.

Effect on strength: Corresponding to the effects of nickel and chromium in refining the grain and increasing the hardness of iron are similar effects of these alloys in increasing the strength—compressive, tensile and transverse—the increases amounting to from 10 to 50 per cent. The action of nickel alone in increasing strength depends upon the presence of a reasonable amount of combined carbon, preferably as high as possible up to 0.80 per cent and certainly not lower than 0.50 per cent. In irons which by reason of high silicon or total carbon content usually show a low combined carbon, chromium may be added simultaneously with the nickel in order to raise the combined carbon content. Another method for accomplishing the same purpose is by the simultaneous reduction of silicon content, allowing the nickel to substitute for silicon in eliminating excess carbide.

Additions Are Suggested

In general, in order to secure substantial strength increase on arbitration bars the following additions are suggested:

For	1.50 per cent Silicon add 0.75—1.00 Nickel	0—0.25 Chromium
	2.00 per cent Silicon add 0.75—1.00 Nickel	0.20—0.40 Chromium
	2.60 per cent Silicon add 0.75—1.00 Nickel	0.40—0.50 Chromium

Effect on toughness: Nickel definitely increases toughness of iron as measured by transverse deflection or other methods. From 3 to 5 per cent additions gives the greatest improvement. Increases in deflection of 100 per cent and consequently in toughness can be obtained in $\frac{1}{8}$ in. to $\frac{1}{4}$ in. sections by the addition of 3 to 5 per cent nickel. In cases in which chromium has been added to further improve strength the nickel will serve to increase toughness or deflection which is often impaired by the chromium.

Effect on shrinkage and porosity: Shrinkage in solidification leading to internal porosity is not increased by the presence of nickel below 5 per cent but in higher silicon gray irons which suffer from shrinkage suitable additions of nickel or nickel and chromium will reduce and may actually eliminate it.

Effect on pattern shrinkage or contraction: Nickel and chromium additions up to 5 per cent and 1 per cent respectively have no effect on contraction of gray iron and the usual pattern allowances are sufficient.

Effect on fluidity: The fluidity of gray iron is not changed by the presence of nickel up to 5 per cent or of chromium up to 0.50 per cent or by combinations of the two within these limits.

The following table lists some of the present typical uses of iron alloyed with nickel or nickel chromium of interest to automotive manufacturers, with recommended alloying content and the reason for adding the alloy:

Articles	Alloy	Reason for Adding Alloy
Thin section resistance grids	5 per cent nickel	To improve toughness
Thin section piston rings	1/3 per cent nickel	To improve toughness, machinability and resistance to wear
Pistons	3/4-1 1/2 per cent nickel	To improve machinability and resistance to wear
Cylinders and sleeves	2 per cent nickel or 1 per cent nickel and 0.3 per cent chromium	To improve density and resistance to wear
Cams	3 per cent nickel	To secure maximum hardness still machinable
Forming dies	1 per cent nickel and 0.40 per cent chromium	To secure strength and toughness

Buses and Trucks Help Railroads

ANY railroad can be operated to a higher degree of efficiency, give better service and with a higher net return if each mile of its line is paralleled by a hard road with bus and truck service running upon it, according to H. E. Barber, president of the Egyptian Transportation System, operating in Southern Illinois.

"In transportation as in other merchandising," he says, "there is a retail and a wholesale department. Motor buses and trucks are the logical vehicles to handle the retail, and the steam train the wholesale department.

"Before we had the hard roads which would permit the retailing of transportation by buses and trucks forty per cent of all local passenger and freight trains—the retail department—were operating at a heavy loss, absorbing practically all profit made on the other sixty per cent of the trains' wholesaling department.

"With the hard roads this should not be required from a railroad any more than it is required of a merchant to sell his goods below cost. It is only a matter of each railroad adapting itself to the conditions.

"The automotive industry submits to even more rigid regulation than that of the railroads. The Illinois regulation governing bus operation requires the bus company to carry insurance on the life of each passenger, which is not required of the railroads. It also requires State license for the bus driver, which is not required of the railroads, and all details even down to the carrying of extra tires to avoid unnecessary delay to the passenger.

"So long as the railroads are run like the Italian fruit stand, 'What is lost on the banana is made up on the peanut,' just so long will the railroads not receive sufficient revenue to properly operate and maintain the railroad and pay a reasonable return of the investment.

"The steam railroad train must take the place in transportation of the river in collecting the rainfall and not expect to get along without its tributaries. The bus and truck would be overflowed quite as much as the

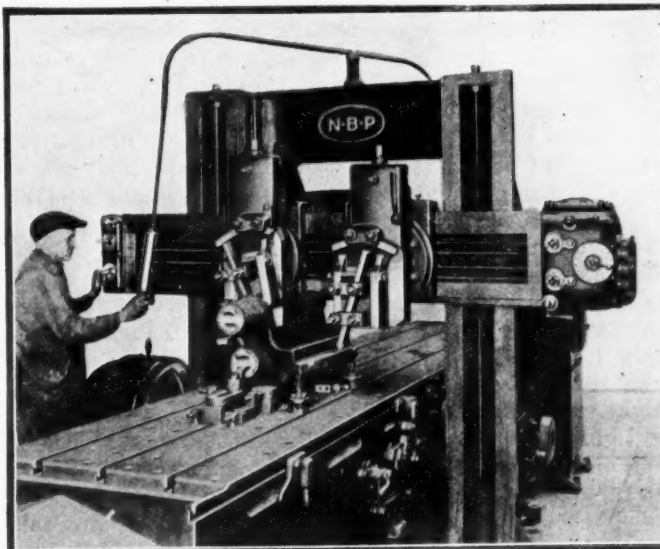
tributaries to the river should they attempt to handle the volume rightly belonging to the river.

"The railroads should have the full cooperation of the public, but they could be more successful and make a greater net return if more information on the question of bus, truck and train service were available to those who operate the railroads."

New Planers in Three Sizes

A NEW line of planers, known as "Timesavers" and made in 36, 42 and 48 in. sizes, has been brought out by the Niles-Bement-Pond Co., New York. While planers are not being used directly in automotive production, the tool and fixture departments of automotive plants are equipped with them, the die-making departments always have them, and in many cases there are one or two planers in the maintenance department.

In order to make the new machines as easy to operate as possible, they have been designed so that the motor at the end of the cross rail power-traverses the cross rail heads and the side heads, elevates and lowers the cross rail and provides power for feeding the cross rail and side heads. While performing these operations the



The Timesaver planer, showing control by pendant switch

motor is controlled by the pendant switch shown in the illustration, and the table dogs.

The pendant switch, which may always be pulled around to the position most convenient for the operator, is used for the following operations: 1, instantly stopping the machine; 2, inching the table back and forth; 3, controlling the travel to the heads and tool slides while traversing; 4, controlling the elevating and lowering of the cross rail; 5, starting the table travel and automatic feed.

The general design of details is in line with the most modern practice in the machine tool field. For instance, the gears used for traversing, feeding and elevating the cross rail are made of steel and hardened. These gears are enclosed in a gearbox. The two large driving gears dip into the oil supply and flood the entire box with oil. As an additional precaution a single shot lubricator is provided.

A safety coupling is provided between the machine and the motor on the rail, consisting of two clutch members held together by a spring. When the load reaches a predetermined amount these members will separate, whereby the machine will be protected from injury.

Gear-Driven Plane Supercharger Passes Dayton Air Tests

Air Service Engineering Division finds early failures due to crankshaft torsional vibration. Use of larger impeller shaft and flexible coupling solved problem.

By David Gregg*

WHEN the necessity of supercharging aircraft engines was shown during the World War, plans were at once started to develop a gear-driven supercharger for the Liberty-12 engine. During the latter part of 1917, Captain Kerr, assisted by M. LeBlanc, designed and constructed a number of small gear driven centrifugal compressors suitable for airplane engine superchargers. The impellers were star shaped and were constructed from a variety of materials including shim steel, wood, rubberized fabric and leather. Although no practical design was produced, much interesting information was obtained before the armistice cut short this project.

In 1921 the problem was taken up by the Engineering Division of the Air Service and a design started for the Liberty engine. The compressor element was an adaptation of the compressor of the turbo supercharger developed jointly by the Engineering Division and the General Electric Company. The impeller was made from forged duralumin to reduce the moment of inertia. As the factor of safety in the impeller is a function of the strength-weight ratio of the material, it is entirely feasible to use the light-weight non-ferrous alloys. After a series of tests on the duralumin impeller the moment of inertia was further reduced by using forged magnesium with deep scallops between the blades. The magnesium for this impeller was produced by the American Magnesium Company by rolling and cold-working a magnesium casting, the resulting impeller having a moment of inertia of only 11 lb.-in.

Splined Onto Hollow Shaft

The impeller was splined onto a hollow shaft at either end by a paired set of open Norma ball bearings. The impeller shaft was splined for its entire length, and the lower end of the splines serrated to form the cutting teeth of a broach. Each succeeding series of teeth were of slightly larger diameter and the difference in diameter between the last teeth and the straight splines gave the amount of forced fit. When this combined broach and shaft was pressed into the impeller it was certain that the amount of forced fit and alignment of the splines were correct. The broach was then ground off and the shaft finished to the desired size. This method of construction was expensive, but was used throughout the experimental work on account of its accuracy and reliability.

In designing the gear drive the Allison Engineering Company of Indianapolis was of great assistance, due to its experience with high speed gearing and the quality

of its work. The impeller was driven by a pinion and gear having a ratio of about 13 to 1. The pinion was hollow and was supported on either side by a paired set of Norma L-20 ball bearings. A small solid shaft, 8½ in. long, was splined into the pinion and then passed through the hollow impeller shaft to a coupling at the outer end. The main gear was driven from the engine crankshaft through a flexible coupling that partially damped out the uneven engine torque and vibration and whip in the crankshaft. It also allowed a small amount of misalignment in fitting the supercharger to the engine without causing any of the driving parts to bind, or placing an initial load on the bearings. The drive had to transmit 56 hp. at a pinion speed of 23,000 r.p.m. The gears were first made in herringbone form of 3½ per cent nickel steel, heat treated and case-hardened, but not ground. Later, straight spur gears and Maag gears were used, all three types giving equally satisfactory service.

50-Hour Endurance Test

After the supercharger had been completed and assembled, a 50-hour endurance test was run on an electric dynamometer at full load. An oil pump built into the supercharger supplied about one gallon of oil a minute in the form of a fine spray, which was directed against the trailing edge of the pinion and gear. The pinion bearings, gear bearings and inner impeller bearings were lubricated by the oil mist in the gear case. The outer impeller bearings had a separate drip feed. When installed in an airplane, it was planned to run an oil line to this point, draining the excess oil back to the gear case.

During the first few hours running, tests were made, using various grades of oil. Thermo-couples were inserted in the walls surrounding the bearings and the temperatures obtained. It was found that the heavier oils worked as well as the lighter oils, but that too much oil caused the bearings to heat. For this reason oil slingers were used on either side of the pinion to keep excess oil from the high speed bearings. After the first tests and adjustments, the oil system was simplified by packing the outer impeller bearings in Tule, a non fluid oil. This was renewed every few hours and gave excellent results.

At the end of 50 hours' running the supercharger was disassembled for inspection. All parts were in excellent shape and showed little wear. The gear teeth had a smooth, burnished surface, but showed no signs of pitting, such as takes place when the unit loads are too high. In fact, it was difficult to distinguish the used gears from a new set. The cages in which the pinion bearings were mounted had loosened up in the aluminum housings and

*This paper covers the work done by the Engineering Division of the Air Service. It does not include investigation done by other agencies, or superchargers submitted to this Division for test, other than those built to Engineering Division designs.

showed perhaps .002 in. play. Hardened steel sleeves were later fastened into the aluminum housing, correcting this trouble. The bearings themselves were in perfect shape and showed no shake or looseness, in spite of the fact that they had turned some 70,000,000 times in 50 hours.

Mounted on Liberty Engine

The supercharger was reassembled and mounted on a Liberty engine on the torque stand. A club was fitted to the engine that would permit a speed of 1,700 r.p.m. at full throttle. After 2½ hours' running the hollow impeller shaft broke between the two outer bearings. As the section at this point had many times the strength of the solid shaft that drove it, failure was laid to faulty material and heat treating, as the shaft had a Brinell hardness of 465. A slightly larger shaft was made and the supercharger and engine installed in a redesigned DH-4B. After considerable ground testing a flight was made on May 21, 1923, by Lt. Ridenour and the writer. At an altitude of 3,000 ft. the solid shaft failed at the root of the

splines. A new shaft was constructed and on July 16 another flight was made when the same failure occurred.

After this the engine and supercharger were taken back to the torque stand and a series of tests made, using different types of solid shafts. The first thing done was to eliminate all sharp sections and to increase the radius of all fillets. However, the shafts still failed. To increase the flexibility a coupling of a ¼-in. thick disk of thermoid about 2¾ in. in diameter was used between the solid drive shaft and the hollow impeller shaft. In spite of this soft or non-metallic drive, the shafts continued to fail.

In an attempt to speed up the test by imposing more severe service, an adaptor was made so that the supercharger could be used on a Curtiss D-12 engine which had a much more rapid acceleration than the Liberty engine. Tests were run on this engine for a total of 40 hours and the severest loads placed on the supercharger without causing failure of any kind. Among other tests, the engine was run at 2,200 r.p.m. with the throttle wide open and then both ignition switches cut off. When the engine speed had dropped to 300 r.p.m. the switches were

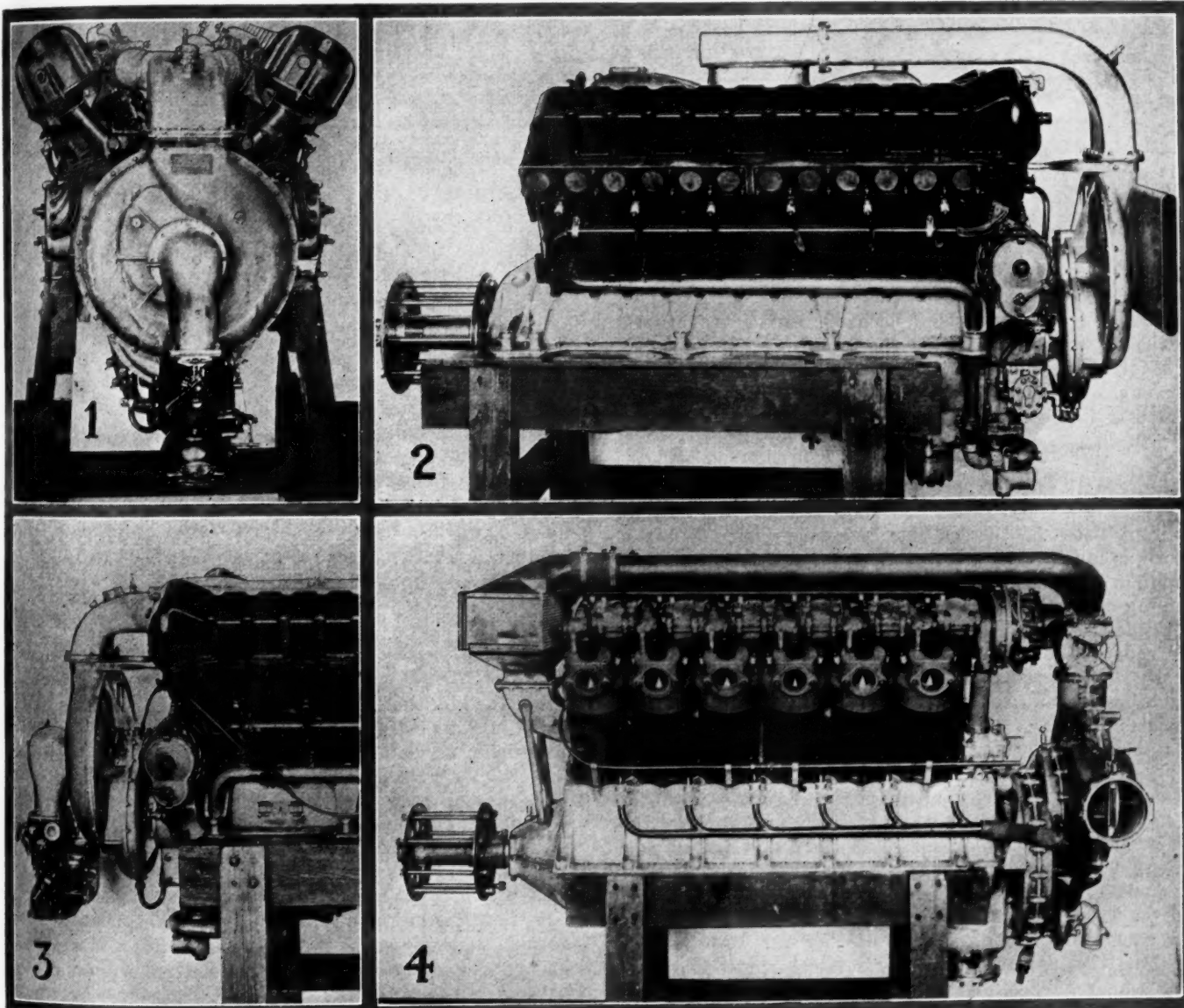


Fig. 1—A supercharged induction system installed on a Curtiss D-12 engine.

Fig. 2—The same supercharger used as a blower, forcing air under pressure to the two carburetors which are regularly used. With this system the fuel must be delivered to the carburetors under a pressure greater than that of the super-

charger, and no advantage is taken of the possibilities of mechanically mixing the fuel and air.

Fig. 3—Side view, supercharged induction system on Curtiss D-12.

Fig. 4—Geared supercharger on the Liberty 12 airplane engine.

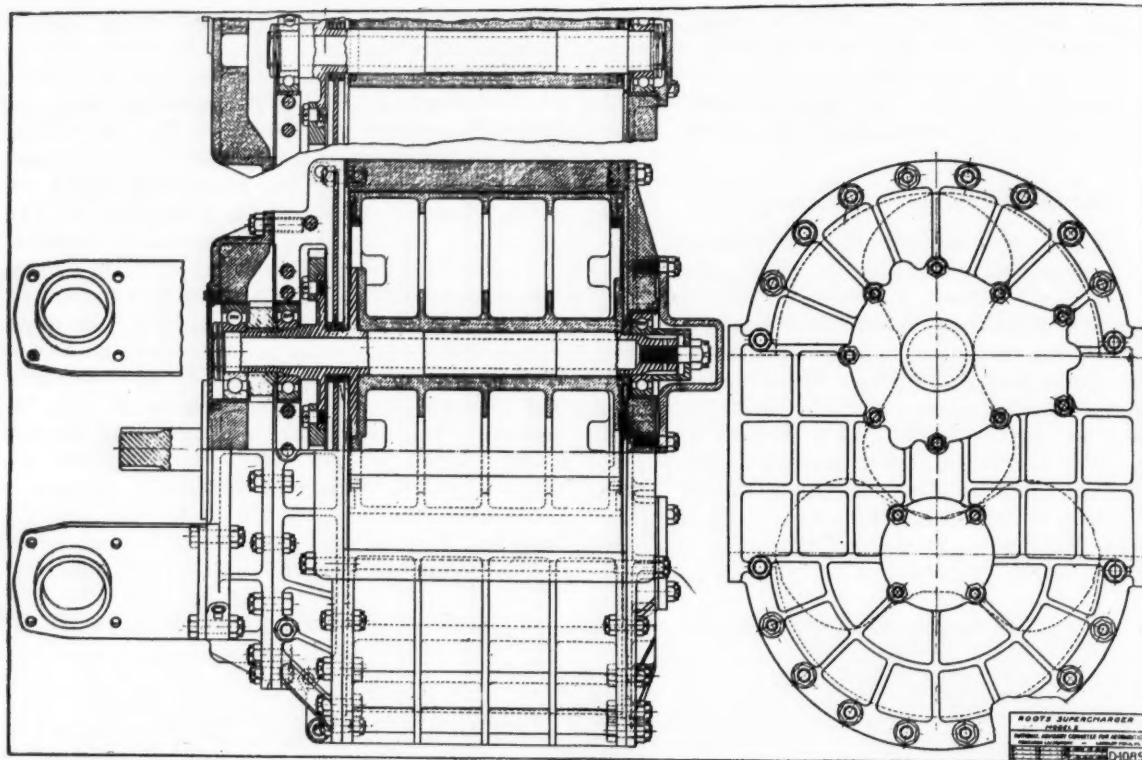


Fig. 5—Design of Roots blower for Liberty engine.

cut in again, letting the engine accelerate as rapidly as possible. This test was repeated 100 times without failure.

From the results of these tests and the fact that the acceleration and deceleration placed on the supercharger were much more severe than it had been on the Liberty engine, it was decided that the failure on the Liberty engine had been due to the torsional vibration of the crankshaft. Former difficulties with the timing gear also pointed to this conclusion.

Flexible Coupling Takes Vibration

Accordingly, the supercharger was put back on the Liberty engine with changes made so that the flexible coupling between the engine and supercharger would absorb as much of the vibration as possible. Two flexible couplings were used on the low speed drive, the thermoid coupling on the high speed drive, and the rim of the drive gear filled with lead to increase its moment of inertia and reduce the shocks transmitted through the gear. Shortly after the test had started, the bearings supporting the pinion gear failed. A second set-up made in the same way also failed. It is possible that the drive gear was either out of balance or distorted at speed enough to overload the pinion bearings. At any rate, this scheme was discarded and tests continued, using different types of solid shafts. After a number of tests successful operation was secured with the largest solid shaft that would pass through the hollow impeller shaft. In addition, the length was increased from $8\frac{1}{2}$ to 11 in. After 28 hours at full load on the torque stand, both supercharger and engine were overhauled for flight test.

This is the point to which the development of the gear driven supercharger, rated at 20,000 ft., has been brought. It has operated on the Liberty engine for 28 hours, and a number of flight tests have been made. It has operated for 40 hours with complete satisfaction on the Curtiss D-12 engine. It is lighter than the turbo-supercharger of similar altitude rating, makes a more compact installation, and offers less head resistance when installed in an

airplane. Subsequent development of this type will probably consist of improvements in details and materials rather than a radical change in design.

In conclusion, the following points have been proven during the course of these tests:

1. A slipping clutch is not necessary in the design of gear-driven superchargers.
2. The most severe loads are caused by torsional vibration of the crankshaft, not by acceleration and deceleration of the engine.
3. Well made ball and roller bearings, properly mounted and lubricated, will give satisfactory service at speeds of 26,000 r.p.m.
4. Properly designed spur gearing will operate continuously at speeds of 26,000 r.p.m.

THE possibilities of "Rubber Production in the Amazon Valley" is the subject of Trade Promotion Series No. 23 published by the Department of Commerce. This is the result of an investigation made by representatives of the Department of that section of South America in which native rubber trees are found or in which soil and climatic conditions are such that their cultivation is possible. It was found that proper combination of physical conditions exists in many localities and over large and contiguous areas of country, many of them readily accessible and others which could be opened up without great expense.

The South American governments are generally very favorable to development of the industry, labor is available in sufficient quantities to take care of considerable production and wages are such that under proper management high grade rubber in large quantities could be produced economically.

The report contains a detailed discussion of all the factors influencing rubber production and will be of great value to those interested in seeing America produce her own rubber.

THE FORUM

Proportions of Valves and Valve Elements

Editor AUTOMOTIVE INDUSTRIES:

For several years I have contended that the intake valve with only 14.7 pounds per square inch of atmospheric pressure behind the incoming charge on the "suction" stroke to overcome the friction of the carbureter, intake manifold and valve passage, should be as large as the construction shape of the explosion chamber will admit, and at all times needs to be larger than is necessary in the exhaust valve, which exhaust valve has behind the burned gases it is allowing to escape, the pressure of the explosion on the opposed piston.

I am pleased to note that some of the manufacturers of passenger cars are using this idea, with a considerable increase in power developed; also, that all cars at the Indianapolis races this year used "superchargers" or fans to give more pressure to the in-going charge.

The foregoing is mentioned simply to emphasize the great importance of the correct design and operation of the valves as related to the power output of any engine.

Now, it follows that the wider the valve seat the more friction the gases have to overcome in getting into and out of the explosion chamber, which at high speeds very much reduces the amount of explosive mixture that has time to get into the explosion chamber, thus reducing the power output.

The valve seat, therefore, should be made as narrow as is practical, considering the material of which the seat is made and the strength of valve spring used.

My experience is that for the smaller and medium-sized passenger car engines 1/16 inch is right, and for the engines of large cars, trucks and tractors, up to 3/32 inch.

With a narrow valve seat, made perfectly round and of the correct angle by means of a cutter on a sleeve fitting tightly in a jig, and a valve ground perfectly round and concentric in a valve-grinding machine, we have a smooth, air-tight joint on which carbon does not tend to accumulate as it does on a ground seat and valve on which the grinding compound has cut grooves and left ridges which, by the way, do not fit together when the valve head expands from the heat during operation.

R. C. HILL

Engineering opinion seems to be pretty much agreed that, as the valves are usually proportioned, a slight increase in the size of the inlet valve has a more important effect on the output of the engine than an equal increase in the size of the exhaust valve, for whenever there is a difference in the size of the two main valves the inlet valves are made the larger. Perhaps one other consideration in this connection is that inlet valves can be made with comparatively large heads without fear of distortion, which is not the case with exhaust valve heads.

We cannot quite agree with our correspondent's arguments with respect to the considerations determining the width of the valve seat. What chiefly determines the resistance to flow through the valve port is the port diameter, and the width of the seat has only an insignificant

effect. The direct frictional resistance between the gases and the wall of the passage is comparatively small. The reason so much pressure is required to force gases through a passage at very high speed, is that the gases at any speed carry kinetic energy proportional to the square of their speed, and this energy must be imparted to them by the suction or pressure acting upon them. If the speed of the gases is doubled, for instance, the energy absorbed by them is quadrupled.

The gases attain their highest speed at the valve port, and after passing through that part they slow up again, a part of their kinetic energy being converted into heat, which increases the temperature of the gas. Therefore, the width of the valve seat has a negligible effect on the filling or the volumetric efficiency of the engine.

On the other hand, the heat absorbed by the valve head must, for the most part, be conducted away through the seat, and if the seat is too narrow, the resistance to heat flow will be great and the valve will not cool so well. Of course, with a narrow seat there is less chance for carbon particles to lodge on the seat and prevent the perfect seating of the valve. In determining the width of seat, the requirement of cooling of the valve as well as that of proper seating must be taken into account.—Editor.

Oil as a Cushioner

Editor AUTOMOTIVE INDUSTRIES:

A recent contributor to *Forum* questions a remark in a recent article of mine in which I stated that the cushioning effect of a heavy oil was of sensible advantage in silencing the small parts of an engine. It appears to be the impression of this contributor that I am deliberately exaggerating the facts. Now the absolute viscosity of a heavy motor oil at average crankcase temperature is easily double that of a medium oil. This means that the oil between the teeth of the timing gears or between a rising cam and its tappet will take exactly twice as long to be squeezed out. It is quite possible to run an engine on kerosene as a lubricant, especially if a few per cent of fatty material is added to give some oiliness. The fats will hardly affect the body or viscosity. Run on this mixture a high grade engine sounds like a motor which is just ready to fall apart. That the viscosity of all petroleum products approaches the same value at high temperatures is true, but this is at over 300 deg. Fahr. and an average crankcase oil operates at 130 to 150 deg. Fahr.

A. LUDLOW CLAYDEN,
Research Engineer, Sun Oil Co.

A SURVEY made by the S. A. E. has shown that although the Society in 1920 standardized inserts for control lever ball handles, the standard was not adopted to any extent and eleven different threads are being used in the inserts at present.

Exports of Cars, Trucks, Tires and Parts

COUNTRIES	GASOLINE PASSENGER CARS										TRUCKS					
	Up to \$500		\$500 to \$500		\$500 to \$1,200		\$1,200 to \$2,000		Over \$2,000		Up to 1 ton		1 to 2½ Tons		Over 2½ Tons	
	No.	Value	No.	Value	No.	Value	No.	Value	No.	Value	No.	Value	No.	Value	No.	Value
Austria	8	\$3,447	2	\$1,401	1	\$1,259										
Azores and Madeira Islands	295	133,024	25	17,490	124	136,267	62	\$96,084	26	\$72,660	48	\$15,922	1	\$1,789		
Belgium							1	1,381								
Bulgaria					10	10,884	12	20,955								
Czechoslovakia	183	205,121	39	29,158	26	26,816	3	4,446	1	3,151	144	60,084	17	19,986		
Denmark			16	12,834	24	26,275	5	7,823			3	3,543	1	1,452		
Finland	1	275			14	15,645	3	4,834	10	26,279						
France	2	1,008	110	81,340	164	172,195	167	258,524	79	218,168	41	23,342	28	31,588		
Germany																
Gibraltar	25	12,275	6	5,043	19	20,563	6	9,243	1	3,372						
Greece	2	1,142			2	2,130	1	1,475	1	2,845						
Hungary																
Iceland and Faroe Islands			6	4,663	4	4,837	2	3,005	3	9,798	1	803				
Italy					4	4,220							1	1,008		
Latvia	13	4,381	2	1,370	3	2,985							5	6,957		
Malta, Gozo and Cyprus Is.	1	500	20	22,107	33	36,742	32	52,126	22	63,708			4	4,589		
Netherlands	24	10,093	10	7,162	8	8,895	6	9,331					7	9,914	1	\$1,388
Norway			1	807											2	4,178
Poland and Danzig	17	8,166	15	11,934	19	22,315	5	7,936	5	12,500			1	2,120		
Portugal			10	7,840	28	29,458	6	9,191	2	5,204						
Rumania	3	1,080									16	7,074				
Russia	158	72,427	87	70,477	189	208,891	59	92,435	28	83,570	31	17,709	11	12,674		
Spain	1	400	125	96,956	54	56,789	28	44,363	11	31,000	1	1,039	14	15,494		
Sweden			5	3,989	19	21,258	10	16,934	29	72,835						
Switzerland	1				7	7,091	6	9,610								
Turkey	18	8,672	238	181,758	83	82,846	54	81,540	20	59,628	561	235,541	66	70,824		
United Kingdom							1	1,806								
Irish Free State					6	6,692	1	1,372	1	2,602						
Yugoslavia	8	3,928														
United States											2	858			27	123,227
British Honduras	2	751									22	14,196	93	128,479		
Canada	343	77,859	410	248,885	538	534,726	217	316,143	45	110,811	3	1,056	2	2,044		
Costa Rica	1	200			7	7,034	7	12,068			2	1,280	25	25,879	1	4,000
Guatemala			4	1,567							1	744				
Honduras	4	1,442	3	2,267	3	3,318	2	2,805								
Nicaragua			2	1,532	5	5,067	2	2,841	11	30,055	18	8,290	9	9,435		
Panama	24	5,840	30	24,552	35	42,119	3	4,474	3	7,500	2	1,515			6	27,190
Salvador			2	1,523	211	220,738	45	68,143	15	39,789	223	71,499	32	48,205	6	20,302
Mexico	410	131,834	170	117,831												
Miquelon			21	15,522	1	1,216										
Newfoundland	4	1,657														
Barbados	4	3,389									26	9,473	7	8,429	1	30,83
Jamaica	29	8,798	11	7,944	1	1,261							3	4,695		
Trinidad and Tobago	4	1,993	5	3,804	3	2,964					8	3,514			1	2,307
Other British West Indies	4	1,457	2	1,580	5	5,212							30	21,235	9	26,662
Cuba	398	147,940	64	44,608	54	54,740	26	39,456	17	50,317	176	40,319			2	4,438
Dominican Republic	156	60,138	6	4,435	8	8,651	3	5,004	4	11,240	24	17,700	1	1,011		
Dutch West Indies	3	1,048	2	1,523	8	8,651					5	1,760	3	882		
French West Indies	2	720														
Haiti	8	3,064	7	5,705	21	21,373	2	2,902			22	9,272	5	6,967	3	4,640
Virgin Islands	1	350									1	160				
Argentina	1,404	542,947	353	264,391	465	474,026	40	63,338	19	56,911	194	82,910	30	57,139	16	45,232
Bolivia			2	1,241	2	2,059	1	1,892	1	2,500	6	3,481	3	4,355		
Brazil	498	185,543	48	32,796	173	183,106	47	67,478	13	34,929	438	184,532	19	21,829	2	6,886
Chile	16	6,785	37	25,214	33	31,930	16	23,747	21	19,014	50	73,456	10	37,516		
Colombia	30	11,583	32	24,024	25	25,363	18	26,043	2	5,268	36	13,874	33	30,494		
Ecuador	1	390							1	2,602			1	1,544		
British Guiana																
Dutch Guiana																
Paraguay	1	360			1	1,008					15	4,536				
Peru	49	18,438	17	13,546	26	28,040	17	24,817	8	20,510	56	23,648	62	69,076	1	5,000
Uruguay	7	3,395	86	65,445	60	61,696	12	16,679	1	2,500	100	25,897	7	9,722	6	16,163
Venezuela	109	41,014	42	33,016	76	77,389	25	35,971	4	12,699	79	33,191	35	41,895	1	5,600
Aden	18	8,730			90	96,883			3	7,663	38	32,951	20	25,265	1	1,983
British India	11	5,620	131	105,748	17	17,471					10	9,847	20	25,742		
Ceylon			23	73,734	56	57,408					4	3,825	8	12,459	4	8,430
Straits Settlements	93	44,402	102	73,734			25	34,689								
Other British East Indies					21	20,722	2	2,818			2	5,000	62	27,649	17	11,315
China	2	1,170	27	20,528												
Chosen			1	700	87	85,275	9	14,091	3	7,500	4	2,576	15	16,055		
Java and Madura			177	144,152	18	18,040	1	1,554					4	4,137		
Other Dutch East Indies	3	1,383	14	10,378												
French Indo China																
Greece																
Hongkong	19	5,400			1	1,200	1	1,653								
Japan	1	300	35	25,288	55	55,967	2	3,102	4	11,037	2	1,782				
Kwangtung	50	18,000	6	5,118												
Palestine and Syria	50	20,324	15	11,210	13	13,264					4	3,200				
Persia																
Philippine Islands	133	34,411	65	52,073	43	47,138	14	20,279	6	14,995	99	39,372	11	14,268	2	3,750
Russia																
Siam	1	500	3	2,532									1	1,108		
Turkey																
Australia	1,663	578,421	1,601	1,115,661	1,224	1,339,484	117	170,141	35	76,334	75	78,352	133	176,882	34	91,322
New Zealand	180	87,663	59	42,758	299	317,039	28	44,189	5	12,547	23	27,792	59	73,686		
British Oceania					2	1,993					1	445				
French Oceania	5	1,655									3	1,128				
Other Oceania											101	35,700				
Belgian Congo			1	830	1	1,083					106	89,904	56	58,930		
British West Africa					339	377,366	51	72,495			4	4,114	8	14,046	1	2,130
British East Africa	128	49,072	782	569,603	29	33,313					2	2,362	3	3,245		
Canary Islands			6	4,630	15	15,862	1	1,509	1	2,500						
Egypt	51	19,350	4	3,124	8	8,135	1	1,575	3	8,450	2	837				
Algeria and Tunis					4	4,397										
Other French Africa	12	3,504			7	6,057					35	13,247	15	14,485		
Italian Africa																
Liberia			3	1,790	2	2,016					1	605	2	898		
Morocco	27	9,991			1	1,078										
Portuguese East Africa	2	992	11	8,832							6	2,916				
Other Portuguese Africa	1	568														
Spanish Africa																
TOTAL	7,024	\$2,616,230	5,156	\$3,725,843	4,935	\$5,229,943	1,219	\$1,837,964	446	\$1,203,177	2,913	\$1,319,451	978	\$1,199,335	143	\$487,721

for September, 1925

Canadian Exports

[illegible]

British Body Builder Designs Own Standardized Line of Bodies

Chalmer & Hoyer, Ltd., have standardized bodies for use on many different chassis. Interchangeability and larger production reduce costs of custom jobs

By M. W. Bourdon

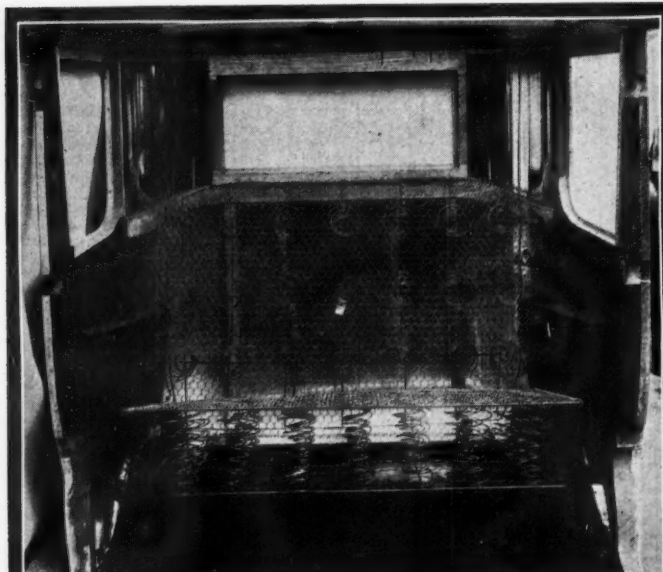
THE number of different body types for which a pronounced demand is experienced by British motor manufacturers has been constantly increasing of late years. In the case of high-priced cars, for which each body is specially made, the body departments of chassis manufacturers are able to supply all the types required, but where popular-priced cars are concerned, with a range of standardized bodies that must be pro-

duced at the minimum cost, it is obviously out of the question to build in the same assembly line, with the same set of machine tools, or with the same staff, a range of bodies that may number anything up to twelve or fourteen.

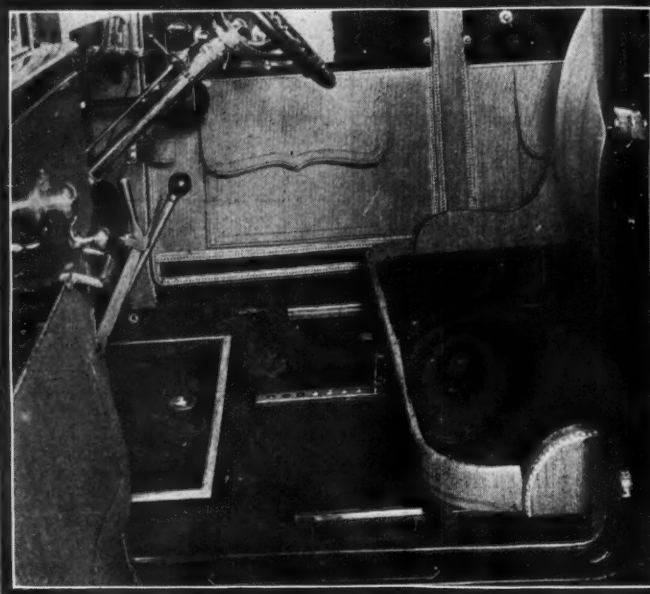
Sectionalizing is necessary, and to a limited extent that occurs in England, a notable case being that of the Standard Motor Co., which has an entirely separate plant of its own producing sedans alone.

The situation is satisfactorily dealt with, however, by certain chassis manufacturers confining their own body plants to one or two types, and placing contracts with body-building specialists for the others.

The case of Morris exemplifies the latter policy. This maker—with by far the largest output in Great Britain, the current rate being approximately 1,500 chassis per week—has for 1926 a range of twelve distinct bodies, five for the 12 hp. "Cowley" and seven for the 14 hp. "Oxford" chassis. The complete cars of each model vary beyond the extent conveyed by their differences in power, in that the "Cowley" is a lower-priced range—the "popular" edition of Morris cars—while the "Oxford"



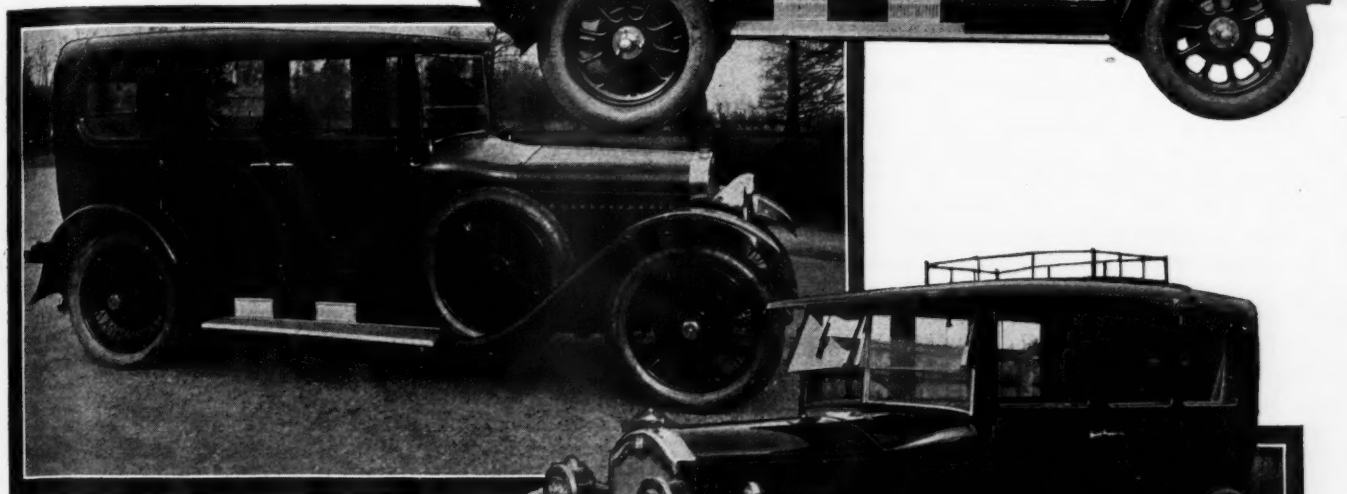
Left: Upholstery springs and woven wire frame of Morris sedan. Below left: Interior view Morris-Oxford sedan showing removable and adjustable front seat. Below: Interior view of salon landaulet on Buick chassis. Pneumatic upholstery is a feature



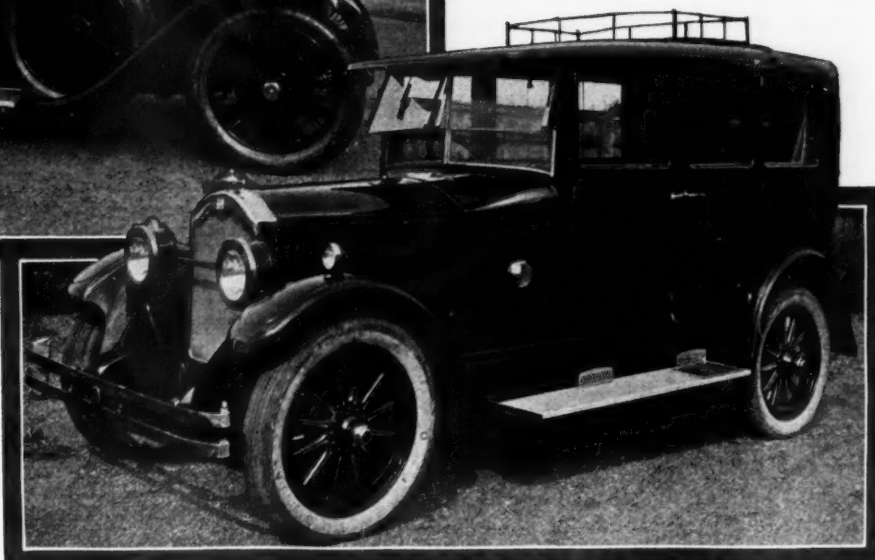
models are all of the "de luxe" type—better finished body-work, a more extensive equipment, etc.

Most of the Morris output consists of open cars—four Cowleys and two Oxfords—and the majority of these are produced in the plant of a company at Coventry which is closely associated with Morris. The latter has his own body department adjoining the chassis plant and there produces

Right: Standard Morris-Oxford sedan built by Chandler & Hoyer.



Above: Seven passenger sedan, a standardized product adaptable to many chassis, here shown mounted on a 15 hp. Delage chassis. Right: Standardized salon landau'et for Buick chassis



the lowest-priced sedan, the Cowley two-door type of which the price has been reduced of late from £250 to £235.

It is not, however, the writer's intention at the moment to deal with the body production methods of Morris or any other chassis maker, but to outline the policy and system adopted by a body-building company which specializes on closed types and produces, among others, the standard four-door sedan for the Morris-Oxford chassis, a complete car selling at £350, of which the chassis price is £182. 10. 0 (£10 more than the chassis for open cars).

This company is Chalmer & Hoyer, Ltd., which has two widely separated plants, one within 20 miles of London, at Weybridge, Surrey, and the other over 100 miles from the Metropolis, at Poole, Dorsetshire. The interest attaching to the operations of this concern relates not only to the production methods employed but also to its policy in regard to financial and merchandising considerations where certain of its customers are concerned.

One of its plants is, or will be shortly after the time of writing, devoted exclusively to the production of the Morris four-door sedan already mentioned. This work is a straightforward contract job, the body being built to an agreed design and specification, at an agreed price for a minimum number of bodies of the one type taken weekly over a period of twelve months. Financial settle-

ments occur at short intervals on the ordinary basis. The same system applies to contract work pure and simple for other British chassis manufacturers, but for certain British and several imported cars a decidedly unusual arrangement with the manufacturers or importers is in force.

Preliminary to an explanation of that special arrangement it must be said that although the range of bodies standardized by British makers and importers is so extensive, it still does not satisfy every demand. Dealers occasionally are asked to supply some type that is outside the standard range of the chassis maker; for example, a folding top sedan or a coupe on a British chassis of which the maker does not standardize one type or the other, or a British-built landau'et or saloon-landau'et on an imported chassis.

So Chalmer & Hoyer arrange with certain British makers and importers to standardize on their own responsibility a range of bodies to meet those special demands. A sample body is made and submitted to the chassis firm; if the latter approves it, it is asked to notify its dealers that it is available. When the dealer secures an order for such a body, the maker or the importer delivers the chassis to the body-builders who return it with very little delay equipped with the required body, and the maker or importer passes it on to the dealer.

In some cases, the body-builder and the dealer are directly in touch by pre-arrangement; the chassis maker or importer does not come into the picture at all, merely delivering the chassis to Chalmer & Hoyer and charging it to the dealer, without the chassis firm even knowing, perhaps, what type of body is to be or has been fitted.

Under this scheme the body makers in question find an outlet for their productions that would otherwise be missed, and for that advantage they have to stand the risk of having capital lying idle for various periods, in the form of finished or partly finished bodies. But after, by inquiries, analyses of reports received from various sources or by simple estimates they feel justified in putting through batches of special bodies for certain chassis. The batches vary in number, ranging from a dozen to fifty.

Plants Comparatively Small

Alongside some American body plants those of Chalmer & Hoyer will appear distinctly small, the present capacity of the two being rather over 100 bodies a week. At Poole a line assembly is being put down to increase the output from 30 to 50 bodies a week of one type, but at Weybridge such a system of production is not justified with a present maximum capacity of 70 a week of various types for different makes of chassis.

At this latter plant what may be termed a semi-production system is followed in some cases; in other words it is not held profitable to prepare a complete set of jigs for contracts or special bodies unless at least 50 bodies can be put through on one order, because, it need hardly be said, the cost of the jigs would exceed the additional cost of labor when working without them.

On the other hand, many of the special bodies—by which is inferred those standardized by Chalmer & Hoyer on their own responsibility, and designed by them—are so planned that a great many of the timbers can be cut and some of them assembled in jigs that have been prepared for other jobs; in other words, interchangeability is carried out as far as possible.

The various sets of jigs in use are identified by different colors applied to the ends or some place where the paint will not be quickly rubbed off or dirtied beyond recognition. Jigs that are used for two or more jobs bear the color allocated to the original one and variously colored stripes identifying them with subsequent jobs. Thus some of the jigs made for contract A and colored red may bear blue and yellow stripes, indicating that the individual jig is also to be used for "specials" B and C. But no unstriped red jig is suitable for anything except A bodies.

Stampings Are Not Used

Until recently all panels have been rolled on the premises, but the increased output of many of the jobs has necessitated this work being put into the hands of specialists. Not even the increase of output on contracts or special bodies has, however, justified the use of stampings or pressings for body "irons;" these are all hand forgings, with power hammers used for the heaviest items.

The following general features of Chalmer & Hoyer bodies may be mentioned: Aluminium is used throughout for the panels, excepting for the cowl, which is of steel sheet to give additional strength. Acetylene welding is freely used for metallic joints. American ash predominates in the framing, with screwed and glued mortise joints. Three-ply wood serves for wheel-arch panels and door linings, while the dashboard is formed of nine-ply.

Mahogany is used for instrument boards, the same wood (or walnut) inlaid appearing over the door pockets in many cases.

The upholstery of the Morris sedan is of Bedford cloth, the cushions and squabs having hour-glass shaped coppered coil springs between top and bottom layers of woven spring-steel wire; each unit thus comprised is encased in canvas, over which is a hair stuffing enclosed by another layer of canvas, the latter surmounted by rolls of wadding held between a further layer of canvas and the upholstery cloth, the last two stitched together between the rolls to form fore-and-aft pleats in the finished cushion.

Cloth or Leather Upholstery

An option is offered in the special bodies, for either spring cushion and squabs or pneumatic upholstery is provided. Another alternative is cloth or leather upholstery coverings; leather is found to be gaining rapidly in popularity for closed bodies, and in some instances a remarkably pliable, though durable, grade of furniture hide is used.

The furniture of all bodies is of a high grade; mechanical lifts are standard for all drop windows, speaking tubes are fitted in two-compartment bodies, electric cigar lighter, ladies' and smokers' companions, locks to the door, silk blinds to all windows including the almost full-width rear light, and several other accessories not included with the chassis.

As distinct from the line assembly system being installed at Poole for Morris sedans, the system of assembly at Weybridge with its variety of types consists of a series of bays on each side of the body shop, each bay serving for the erection of one framing at a time by two men, who put together all the timbers, except those made up earlier into roof framing, doors and other units with or without jigs. A Morris sedan frame is erected completely by the two men in from 2 to 2½ days, the men being paid a standing wage plus a bonus for every body completed. After inspection, the bodies leave the bays for the central gangway, whence they move on as required to the panel shop.

Labor Charges Vary

The labor charges on similar types of bodies vary in a remarkable manner, as the following will indicate: Taking the fully jigged and line assembly job as the unit, the other extreme in labor costs is represented by jobs that cost eight times as much. There are many others coming between the two—the "semi-production" jobs—the most costly being the entire "hand-made" bodies put through as samples or to orders for two or three only.

A similar system of standard wage and bonus by results applies in all departments—painting, trimming, upholstery units, etc. Approximately 420 hands are employed at Weybridge and 300 at Poole, numbers that include administrative staffs as well as those confined to production. Administration is, however, concentrated as far as possible at Weybridge.

Among the special bodies made under the scheme outlined in the foregoing is a saloon landaulet for the 27 hp. Buick, a seven-passenger two-compartment body which sells in England at about £20 less than the Fisher Body Corporation's Imperial limousine on the same chassis, viz., £715, though the American body has to carry the import duty. Certain types of bodies are standardized under the same scheme for Chryslers, Fiats and other imported chassis, and for Standards and Crossleys among British cars.